

**KING COUNTY CONVEYANCE SYSTEM
IMPROVEMENT PROJECT**

**MILL CREEK / GREEN RIVER SUBREGIONAL
AREA**

FINAL TASK 250 SUPPLEMENT REPORT

SOOS PLANNING ZONE

JULY 2001

HDR
In Association with

Herrera Environmental Consultants, Inc.

Note:

Some pages in this document have been purposefully skipped or blank pages inserted so that this document will copy correctly when duplexed.

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INTRODUCTION

The Conveyance System Improvements Project (CSI) is a comprehensive evaluation of the county conveyance system and an assessment of requirements to transport flows projected to the year 2050. General alternatives for additional capacity in the Mill Creek/Green River Subregional Planning Area (MC/GR) were identified and subsequently developed into working alternatives. The work progress and results were reported in Task 210 through 250 for the MC/GR.

Wastewater flow projections by decade to year 2050 were developed for the MC/GR and presented in the Task 240 report. The flow projections were distributed throughout the MC/GR SPA to specific areas called Flow Projection Areas (FPAs), which conform to local agency collection systems. Using the King County hydraulic model, the flow was then routed into the King County conveyance system to assess future lack of capacity. Based on these results, alternatives for providing the required conveyance capacity were developed. For purposes of organizing results and describing alternatives, the MC/GR was divided into three areas or planning zones: Kent, Auburn, and Soos, as shown in Figure 250S-1.

The alternatives developed in Task 240 were defined to planning level for comparative evaluation. Initial definition of alternatives included pipe size; general alignment; and recognition of significant features such as roadways, railroads, streams, and wetlands. Comparative evaluation of alternatives was presented in the Task 250 report. The primary basis for comparison was cost. Pipe size estimates were used for selecting construction cost unit prices. However, the alternatives were not detailed to the extent that a specific project budget could be identified. The potential impact of infiltration and inflow (I/I) reduction on alternative design and cost was also evaluated and presented in the Task 250 report.

Four alternatives for the Soos planning zone were developed in the Task 250 Report. Alternative 3, shown in Figure 250S-2, was chosen as the working alternative for the Soos Planning Zone. Additional development and evaluation of the working alternative is presented in this supplement to the Task 250 report. A previous supplement provided additional information on the working alternatives for the Kent and Auburn planning zones.

The working alternative for the Soos Planning Zone includes all project components of Alternative 3. The additional work described in this supplemental report focuses on optimizing the hydraulic capacity of the proposed project and validates or revises alignments and grades to accommodate critical service elevations and physical constraints. Alignment improvements were developed based on existing construction corridors and opportunities to minimize impacts on the public and existing improvements.

Construction estimates were prepared for the general alternatives developed in the MC/GR Task 250 report using a cost tables presented in *King County Conveyance System Improvement Project Conveyance System Cost Estimates Task 250 Draft Report*. The tables presented in that report are based on a fixed average condition for varying pipe diameter and are derived from an extensive cost spreadsheet model that develops cost for a variety of construction scenarios. The cost spreadsheet model allows specific conditions including depth and unit material prices to be factored into a specific unit price for a constructed facility.

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Figure 250S-1. Kent, Auburn , and Soos Planning Zone

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Figure 250S-2. Working Alternative for Soos Planning Zone

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The cost spreadsheet model developed by King County was later refined and released as the CSI cost model Tabula version 0.6.2. The final planning level estimated construction costs presented in the Task 250 report for the MC/GR used Tabula version 0.6.2, and were developed from preliminary system configurations. Construction cost estimates presented in this Soos Planning Zone Task 250 Supplement report were also developed using Tabula, and are presented in Appendix A. However, they reflect the more detailed work described in this report. As a result, the costs presented in this report differ slightly from the estimates presented in the MC/GR Task 250 report.

Table 250S-1 presents preliminary and final planning level estimated construction costs and total project cost. The total project cost is estimated from King County's budget model. The budget model calculates total project costs based on construction costs generated by Tabula and percentage allowances for various non-construction project requirements.

Table 250S-1. Final Planning Cost Summary for Soos Working Alternative

Working Alternative Project	Preliminary Planning Level Estimated Construction Cost ^a from 250 Report (million dollars)	Final Planning Level Estimated Construction Cost ^a (million dollars)	Total Project Cost (million dollars)
Pump Station H	\$3,191,000	\$2,327,000	\$4,932,400
Forcemain H	\$270,000	\$274,000	\$586,500
Pump Station F	\$5,211,000	\$4,877,000	\$10,336,900
Forcemain F	\$3,346,000	\$1,370,000	\$2,902,100
Pump Station B	\$2,092,000	\$2,765,000	\$5,930,900
Forcemain B	\$2,172,000	\$3,241,000	\$6,953,100
Pump Station D	\$9,635,000	\$8,587,000	\$18,423,300
Forcemain D	\$11,879,000	\$8,006,000	\$16,969,500
Pump Station C (Early Implementation)	\$5,000,000	\$5,164,000	\$11,079,800
Soos Gravity Sewers	\$32,957,000	\$39,435,000	\$80,511,300
		Total Project Cost	\$158,625,800

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

Final predesign studies may find certain elements over-estimated while others are under estimated. The estimates presented in Table 250S-1 may be reduced by refinement during design. Estimated construction costs are presented in year 2001 dollars. Final project estimates should be escalated to the year of construction. Pipeline cost has been assumed to include import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. Gravity sewers from individual conveyance projects are combined into the line item – 'Soos Gravity Sewers' heading. The total project cost for the Soos Planning Zone working alternative is \$158,625,800.

WORKING ALTERNATIVE COMPONENTS

For purposes of discussion, the Soos Planning Zone working alternative is presented as including five components: Pump Station H and conveyance to Point E; Pump Station F and conveyance to Point E; conveyance from Point E to Pump Station D (SR18 Interceptor); Pump Station B and conveyance to Pump Station D; and Pump Station D and Conveyance to Point A. Each component includes one of more specific projects which are illustrated in Figure 250S-2.

Each component project is discussed in the following sections. General plan and profile sheets are presented at the end of each component project discussion to document the refined projects and provide a basis for the refined cost estimates presented in this supplemental report. These project refinements are presented at a planning level, subject to further revisions as project implementation proceeds. Design issues and constraints that will impact project implementation are also described.

PUMP STATION H AND CONVEYANCE TO POINT E

A regional pump station (Pump Station H), Forcemain H, and gravity sewer (Black Diamond Parallel Interceptor) are proposed to convey flows from contributing basins to Point E as shown in Figure 250S-3. Pump Station H would operate at about 33 feet total dynamic head. The conveyance to Point E includes approximately 1,000 feet of forcemain and 35,000 feet of gravity sewer.

The existing Black Diamond Pump Station (referred to as Pump Station G) conveys flow to the Black Diamond Interceptor, which discharges to Soos Creek Water & Sewer District (SCWSD) Lift Station 11, near Point E. Pump Station G will remain in service, dedicated to its present service area, through the planning period. The combined capacity of Pump Station G and Pump Station H would be adequate for the projected flows through year 2050.

Since Forcemain H and the Black Diamond Parallel Interceptor would likely be constructed parallel to the Black Diamond Interceptor, no plan and profiles are provided. Quantities for cost estimates were developed from the contract drawings for the 1991 Water Pumping and Conveyance Facilities project.

The following photographs depict existing conditions along Forcemain H and the Black Diamond Parallel Interceptor alignment. The approximate location of each photo is indicated in Figure 250S-3. A brief description of access concerns for each representative section of the proposed alignment is included.

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Figure 250S-3. Pump Station H and Conveyance To Point E

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P1: Roberts Drive – Rock Creek to Lake Sawyer Rd SE

Vehicular access along Roberts Drive must be maintained. Impacts to Rock Creek should be minimized.



P2: Lake Sawyer Rd SE – Roberts Dr to 224th Ave SE

Access to homes, businesses, and roadways must be maintained.



P3: 224th Ave SE – Lake Sawyer Rd SE to SE 296th Street

Access to homes, businesses, and roadways must be maintained.



P4: 296th St – 224th Ave SE to 216th Ave SE

Access to homes, businesses, and roadways must be maintained.



P5: Covington-Sawyer Rd – 216th Ave SE to 202nd Ave SE

Access to roadways and homes must be maintained.



P6: 202nd Ave SE – Covington-Sawyer Rd to SE 284th St:

Access to roadways and homes must be maintained.



P7: 193rd Ave SE – SE 284th St to 192nd Pl SE:

Access to roadways and homes must be maintained.



P8: 192nd Pl SE – 193rd Pl SE to Kent Langley Rd:

Access to roadways and homes must be maintained.



P9: Kent Langley Rd – 193rd PI SE to 192nd Ave SE:

Access to roadways, homes, and businesses must be maintained.



P10: 192nd Ave SE – Kent Langley Rd to SE Timberlane:

Access to roadways and homes must be maintained.



P11: SE Timberlane – Kent Langley Rd to 180th Ave SE:

Access to roadways and homes must be maintained.



PROJECT IMPACTS

Typical temporary construction related impacts may include increased noise, dust and construction vehicle traffic. Temporary partial road closures may be required. Trees and other vegetation may be impacted by pipeline and pump station excavation.

Impacts to citizens, businesses, and the environment are of concern with interceptor alignments. Access to neighboring residences and businesses must be maintained throughout construction. Impacts to traffic are expected.

Streams should not be impacted by construction. Jacking or tunneling pipeline construction methods would eliminate impacts to streams. A minimum separation of five feet is recommended between streambed and pipe crown in order to allow for natural streambed movement. Jacking and receiving pits should be located away from the streambank to avoid erosion.

Table 250S-2 lists existing utilities and roadway characteristics observed during planning level field inspection along Pump Station H's Conveyance Alignment.

Table 250S-2. Existing Conditions-Pump Station H Conveyance Alignment

														Roadway Lanes					Traffic Lanes			Parking Lanes	
Conveyance Component Alignment		UGT	Water	Sewer	Storm Drain	Gas	OHP	UGP	Bike Lanes	Sidewalk	Stream Crossing	Easement	Street Trees	Highway	Major Arterial	Secondary Arterial	Collector	Local	1	2	4	1	2
P1	Roberts Dr - Rock Creek to Lake Sawyer Rd SE		x	x		x	x						x		x						x		
P2	Lake Sawyer Rd Se - Roberts Rd SE to 224th Ave SE		x	x		x	x						x		x						x		
P3	224 th Ave Se – Lake Sawyer Rd SE to SE 296 th Street		x	x			x						x		x						x		
P4	296 th St – 224 th Ave SE to 216 th Ave SE		x	x			x						x		x						x		
P5	Covington-Sawyer Rd – 216 th Ave SE to 202 nd Ave SE		x	x			x						x		x						x		
P6	202 nd Ave SE – Covington-Sawyer Rd to SE 284 th St		x	x			x						x				x				x		
P7	193 rd Ave SE – SE 284 th St to 193 rd PI SE		x	x				x					x				x				x		
P8	192 nd PI SE – 193 rd PI SE to Kent Langley Rd	x	x	x				x			x	x	x					x			x		
P9	Kent Langley Rd – 193rd PI SE to 192 nd Ave SE		x	x			x						x		x						x		
P10	192 nd Ave SE – Kent Langley Rd to SE Timberlane		x		x					x			x				x				x		
P11	SE Timberlane – Kent Langley Rd to 180 th Ave SE			x													x						

PERMIT REQUIREMENTS

A ROW Use Permit from King County Roads Department is required for construction within the right of way. City of Black Diamond construction permits will be required for pump station and pipeline construction. The discharge from dewatering operations may require a section 401 water quality certificate form the Washington Department of Ecology or a King County Industrial Waste Discharge Permit. A State Environmental Policy Act checklist is required. A building permit will be required for the pump station. A Hydraulic Project Approval will be required at non-tunneled stream crossings.

EASEMENT AND PROPERTY ACQUISITION

Construction within this area may require additional consideration by the City of Black Diamond. Acquiring property for the pump station should not be difficult because most of the area surrounding Pump Station H is undeveloped. Further investigation to identify suitable pump station sites should be conducted during project predesign.

OPERATION AND MAINTENANCE

Pump Station H's conveyance system includes a gravity sewer and forcemain. No routine or scheduled maintenance is anticipated for either type of pipeline.

Pump stations have specific operations and maintenance (O&M) requirements depending on configuration, frequency of use, and other factors. In general, design considerations to reduce labor, parts replacement and downtime should be considered during predesign.

DESIGN ISSUES AND CONSTRAINTS

Constraints to be resolved during design include location of Pump Station H, connection to the existing sewer, stream crossings, and avoiding or relocating existing utilities. Provisions must be in place to provide access to homes, businesses, parks, and other facilities along the impacted roadways throughout construction.

A major design constraint is the location of Pump Station H. The station should be located such that most or all flows from contributing basins can be conveyed to the station by gravity pipelines. The pump station should also have little or no impact on neighboring communities and avoid environmentally sensitive areas.

For planning purposes, the station is currently located at a low point in the service area. This area is heavily wooded, adjacent to Rock Creek, and adjacent to a possible wetland. It is likely not a suitable site for a pump station. Further investigation to identify a suitable pump station site should be conducted during the predesign phase. Acquiring property for the pump station should not be difficult since most of the area surrounding Pump Station H is undeveloped.

Construction Cost Estimate

Table 250S-3 shows construction cost estimates for the component project. The cost estimates presented are based on Tabula. Pipeline cost includes import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. Pipeline details were developed from the contract drawings for the 1991 Water Pumping and Conveyance Facilities project. Pump station estimates include assumptions for site/civil, electrical/instrumentation, architectural/structural, and mechanical components based on a fixed cost per mgd of flow pumped. The estimates are conservative and subject to reduction by refinement during predesign. The construction cost estimate for Pump Station H, Forcemain H and the Black Diamond Parallel Interceptor is approximately \$20,297,000. The gravity sewer portion of this cost is about \$17,697,000, which is included in the Soos Gravity Sewers cost line item in Table 250S-1.

Table 250S-3. Estimated Construction Cost-Pump Station H and Conveyance to Point E

Working Alternative Project	Average Depth (ft)	Quantity	Unit	Estimated Construction Cost ^a (million dollars)
Pump Station H				
Pump Station H	-	1	LS	\$2,326,962
Forcemain H (open cut construction)				
12 inch	6	1,000	LF	\$273,309
Pipeline (open cut construction)				
21 inch	Varies	25,345	LF	\$13,946,905
18 inch	Varies	7,610	LF	\$3,101,166
15 inch	Varies	800	LF	\$373,653
12 inch	Varies	370	LF	\$140,955
10 inch	Varies	370	LF	\$133,952
Pump Station H Total				\$20,297,000

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

PUMP STATION F AND CONVEYANCE TO POINT E

The second component for the Soos Planning Zone working alternative includes a regional pump station, (Pump Station F), Forcemain F, and gravity sewer to convey flows from contributing basins to Point E as shown in Figure 250S-4. Pump Station F could be constructed in the vicinity of the existing SCWSD Lift Station 15B. Pump Station F would operate at about 152 feet total dynamic head. Conveyance to Point E includes approximately 4,300 feet of forcemain and 11,700 feet of gravity sewer. Forcemain F exits the pump station site to the south into an existing easement between 214 Avenue SE and SE Wax Rd. The forcemain continues west along this alignment to near SR18. Near SR18, the forcemain transitions to gravity sewer and continues along the alignment to SE Wax Rd. The gravity sewer continues southwest along SE Wax Rd from 180th Avenue SE to SR18.

SCWSD Lift Station 15B currently delivers flow to SCWSD Lift Station 10. SCWSD Lift Station 15B's forcemain would be reconfigured to discharge to the new gravity sewer, while SCWSD Lift Station 15B would be replaced with Pump Station F.

The following photographs depict existing conditions along Forcemain F and the gravity sewer alignment. The approximate location of each photo is indicated in Figure 250S-4. A brief description of access concerns for each representative section of the proposed alignment is included.

P1: 215th Ave SE – Pump Station F to Easement

Vehicular access will probably be impossible to maintain due to the limited space available for sewer construction. Access to homes and SCWSD Lift Station 15B must be maintained.



P2: SE Wax Rd – SE 240th Street to 180th Ave SE

Access to businesses, homes, and adjacent roadways must be maintained.



P3: 180th Ave SE – SE Wax Rd to SR18

Access to businesses, homes, and adjacent roadways must be maintained. Sewer construction along SR 18 will likely require alternate methods of construction such as microtunneling.



The alignment presented follows an existing easement and developed roadways. Further investigation to determine the status and boundaries of the easement should be conducted during predesign. SCWSD Lift Station 15B's effluent forcemain and gravity trunk is located within the easement.

The project alignment is shown on preliminary plan and profile sheets at the end of this project discussion.

PROJECT IMPACTS

Typical temporary construction related impacts may include increased noise, dust and construction vehicle traffic. Temporary partial road closures may be required. Trees and other vegetation may be impacted by pipeline and pump station excavation.

Impacts to citizens, businesses, and the environment are of concern with proposed interceptor alignments. Access to neighboring residences and businesses must be maintained throughout construction. Impacts to traffic are expected.

Streams should not be impacted by pipeline construction. Eliminating impacts may be accomplished by jacking or tunneling. A minimum separation of five feet is recommended between streambed and pipe crown in order to allow for natural streambed movement. Jacking and receiving pits should be placed away from the streambank to avoid erosion.

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Figure 250S-4. Pump Station F and Conveyance to Point E

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Table 250S-4 includes existing utilities and roadway characteristics observed during planning level field inspection along Pump Station F's Conveyance Alignment.

Table 250S-4. Existing Conditions-Pump Station F Conveyance Alignment

														Road Way Type		Traffic Lanes		Parking Lanes					
Conveyance Component Alignment		UGT	Water	Sewer	Storm Drain	Gas	OHP	UGP	Bike Lanes	Sidewalk	Stream Crossing	Easement	Street Trees	Airport	Major Arterial	Secondary Arterial	Collector	Local	1	2	5	1	2
P1	215th Ave SE – Pump Station F to Easement	x	x					x					x					x	x				
P2	SE Wax Rd – SE 240th Street to 180th Ave SE	x	x		x		x						x			x				x			
P3	180th Ave SE – SE Wax Rd to SR18	x	x	x	x		x		x	x			x			x				x			

PERMIT REQUIREMENTS

A ROW Use Permit from King County Roads Department is required for construction within the right of way. The discharge from dewatering operations may require a section 401 water quality certificate from the Washington Department of Ecology or a King County Industrial Waste Discharge Permit. A State Environmental Policy Act checklist is required. A building permit will be required for the pump station. A Hydraulic Project Approval will be required at non-tunneled stream crossings.

EASEMENT AND PROPERTY ACQUISITION

Property acquisitions are anticipated for Pump Station F. Further investigation to identify suitable pump station sites should be conducted during project predesign.

OPERATION AND MAINTENANCE

Pump Station F's conveyance system includes a gravity trunk and forcemain. No routine or scheduled maintenance is anticipated for either type of pipeline.

Pump stations have specific O&M requirements depending on configuration, frequency of use, and other factors. In general, design considerations to reduce labor, parts replacement and downtime should be considered during predesign.

DESIGN ISSUES AND CONSTRAINTS

Constraints to be resolved during design include connection to the existing sewer, location of Pump Station F, stream crossings, and avoiding or relocating existing utilities. In general, provisions must be in place to provide access to homes, businesses, and SCWSD Lift Station 15B along the pipeline alignments throughout construction.

A major design constraint is the location of Pump Station F. The station should be located such that most or all flows from contributing basins can be conveyed to the station by gravity pipelines. It should also have little or no impact on neighboring communities and avoid environmentally sensitive areas.

For planning purposes, Pump Station F is located adjacent to SCWSD Lift Station 15B. If the station were south of its current location it would have a larger service area. In the current location, conveyance facilities would be required to deliver flows from the southern portions of the service area. Suitable pump station sites should be identified during the predesign phase.

CONSTRUCTION COST ESTIMATE

Table 250S-5 shows construction cost estimates for the component project. The cost estimates presented are based on Tabula. Pipeline costs include import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. Pump station estimates include assumptions for site/civil, electrical/instrumentation, architectural/structural, and mechanical components based on a fixed cost per mgd of flow pumped. The estimates are conservative and subject to reduction by refinement during predesign. The construction cost estimate for Pump Station F, gravity sewer, and Forcemain F is approximately \$13,037,000. The gravity sewer portion of this cost is about \$6,790,000, which is included in the Soos Gravity Sewers cost item in Table 250S-1.

Table 250S-5. Estimated Construction Cost-Pump Station F and Conveyance to Point E

Working Alternative Project	Average Depth (ft)	Quantity	Unit	Estimated Construction Cost ^a (million dollars)
Pump Station F				
Pump Station F	-	1	LS	\$4,876,689
Forcemain F (open cut construction)				
16 inch	6	4,300	LF	\$1,369,139
Pipeline (open cut construction)				
27 inch	13	9,300	LF	\$5,363,102
24 inch	19	1,750	LF	\$1,096,293
21 inch	17	600	LF	\$330,897
Pump Station F Total				\$13,037,000

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

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PLAN AND PROFILE SHEETS PUMP STATION F TO POINT E

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CONVEYANCE FROM POINT E TO PUMP STATION D (SR18 INTERCEPTOR)

Under the third component project, flows from Pump Stations F and H are routed to Point E, combined in the SR18 Interceptor, and conveyed to Pump Station D. The SR18 Interceptor includes 12,100 linear feet of gravity sewer and is shown along SR18's alignment in Figure 250S-3.

The following photograph depicts existing conditions along the proposed gravity interceptor. Included is a brief description of access concerns for the proposed alignment.

P1: SR18 – Point E to Pump Station D

Picture taken on 180th Ave SE looking southwest along SR18. Roadway and shoulder access must be maintained.



The project alignment is shown on preliminary plan and profile sheets at the end of this project discussion.

PROJECT IMPACTS

Typical temporary construction related impacts may include increased noise, dust and construction vehicle traffic. Temporary partial road closures may be required. Trees or other vegetation may be impacted by excavation.

Impacts to citizens, businesses, and the environment are of concern along interceptor alignments. Access to neighboring residences and businesses must be maintained throughout construction. Impacts to traffic are expected.

Streams should not be impacted by construction. Jacking or tunneling pipeline construction methods would eliminate impacts to streams. A minimum separation of five feet is recommended between streambed and pipe crown in order to allow for natural streambed movement. Jacking and receiving pits should be placed away from the streambank to avoid erosion.

Table 250S-6 lists existing utilities and roadway characteristics observed during planning level field inspection along the SR 18 Interceptor Alignment.

PERMIT REQUIREMENTS

Work within SR18's right of way will require a Franchise from the Washington State Department of Transportation. The discharge from dewatering operations may require a section 401 water quality certificate form the Washington Department of Ecology or a King County Industrial Waste Discharge Permit. A State Environmental Policy Act checklist is required. A Hydraulic Project Approval will be required at non-tunneled stream crossings.

Table 250S-6. Existing Conditions-SR 18 Interceptor Alignment

												Roadway Type					Traffic Lanes		Parking Lanes			
Conveyance Component Alignment		UGT	Water	Sewer	Storm Drain	Gas	OHP	UGP	Bike Lane	Sidewalk	Stream Crossing	Easement	Street Trees	Highway	Major Arterial	Secondary Arterial	Collector	Local	2	4	1	2
P1	SR18 - Point E to Pump Station D				x						x			x						x		

EASEMENT AND PROPERTY ACQUISITION

Easements and property acquisitions are anticipated for the SR18 Interceptor, and jacking and receiving pits will be required for tunneling. Suitable locations for jacking and receiving pits should be identified during predesign.

OPERATION AND MAINTENANCE

The SR18 Interceptor includes a gravity sewer. No routine or scheduled maintenance is anticipated for this type of pipeline.

DESIGN ISSUES AND CONSTRAINTS

Constraints to be resolved during design include avoiding or relocating existing utilities, stream crossings, and connection to gravity sewers and Pump Station D. Provisions must be in place to provide access to impacted roadways throughout construction.

Critical elevations for the proposed alternative are the upstream connection at Point E and the connection to Pump Station D.

Approximately 6,000 feet of the pipe crown of the SR18 Interceptor is greater than 25 feet deep. Open cut construction of pipe at these depths is likely not feasible. Therefore, microtunneling will probably be required.

CONSTRUCTION COST ESTIMATE

Table 250S-7 shows construction cost estimates for the component. The cost estimates presented are based on Tabula. Pipeline costs include import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. The estimates are conservative and subject to reduction by refinement during predesign. The construction cost estimate for the SR18 Interceptor is approximately \$12,457,000, which is included in the Soos Gravity Sewers cost line item in Table 250S-1.

Table 250S-7. Estimated Construction Cost-SR 18 Interceptor

Working Alternative Project	Average Depth (ft)	Quantity	Unit	Estimated Construction Cost ^a (million dollars)
Pipeline (open cut construction)				
42 inch	17	4,000	LF	\$3,389,162
27 inch	13	2,100	LF	\$870,438
24 inch	13	600	LF	\$366,943
Pipeline (Microtunnel)				
42 inch	25	6,000	LF	\$7,830,392
SR18 Interceptor Total				\$12,457,000

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

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PLAN AND PROFILE SHEETS FOR SR 18 INTERCEPTOR

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PUMP STATION B AND CONVEYANCE TO PUMP STATION D

The fourth component project includes a regional pump station (Pump Station B) and Forcemain B to convey flows from contributing basins to Pump Station D as shown in Figure 250S-5. Pump Station B would operate at about 135 feet total dynamic head. Conveyance to Pump Station D includes approximately 10,000 feet of forcemain. Forcemain B exits the pump station and is routed northeast along SR18 to Pump Station D.

The following photographs depict existing conditions along the proposed forcemain alignment. The approximate location of each photo is indicated in Figure 250S-5. A brief description of access concerns for each representative section of the proposed alignment is included.

P1: SR18 – Pump Station B to Pump Station D

Roadway and shoulder access must be maintained.



The project alignment is shown on preliminary plan and profile sheets at the end of this project discussion.

PROJECT IMPACTS

Typical temporary construction related impacts may include increased noise, dust and construction vehicle traffic. Temporary partial road closures may be required. Trees and other vegetation may be impacted by pipeline and pump station excavation.

Impacts to citizens, businesses, and the environment are of concern with interceptor alignments. Access to neighboring residences and businesses must be maintained throughout construction. Impacts to traffic are expected.

Table 250S-8 lists existing utilities and roadway characteristics observed during planning level field inspection along Pump Station B’s conveyance alignment.

Table 250S-8. Existing Conditions-Pump Station B Conveyance Alignment to Pump Station D

															Roadway Type		Traffic Lanes		Parking Lanes				
Conveyance Component Alignment		UGT	Water	Sewer	Storm Drain	Gas	OHP	UGP	Bike Lanes	UGT	Sidewalk	Stream crossing	Easement	Street Trees	Highway	Major Arterial	Secondary Arterial	Collector	Local	2	4	1	2
P2	SR18 – Pump Station B to Pump Station D				x							x			x						x		

PERMIT REQUIREMENTS

A ROW Use Permit is required from the King County Roads Departments for construction within the right of way. The discharge from dewatering operations may require a section 401 water quality certificate from the Washington Department of Ecology or a King County Industrial Waste Discharge Permit. A State Environmental Policy Act checklist is required. A building permit will be required for the pump station. A Hydraulic Project Approval will be required for any non-tunneled stream crossings.

EASEMENT AND PROPERTY REQUIREMENTS

Property acquisitions are anticipated for Pump Station B. Further investigation into pump station siting should be conducted during the project’s predesign phase.

OPERATION AND MAINTENANCE

Pump Station B’s conveyance system includes a gravity sewer and forcemain. No routine or scheduled maintenance is anticipated for either type of pipeline.

Pump stations have specific O&M requirements depending on configuration, frequency of use, and other factors. In general, design considerations to reduce labor, parts replacement and downtime should be considered during predesign.

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Figure 250S-5. Pump Station B and Conveyance to Pump Station D

8 ½ x 11 color figure

Back page for figure 250S-5

DESIGN ISSUES AND CONSTRAINTS

Constraints to be resolved during design include connection to the existing sewer, location of Pump Station B, stream crossings, and avoiding or relocating existing utilities. In general, provisions must be in place to provide access to homes and businesses along the alignment throughout construction. The operation of SR18 must be maintained throughout construction.

A major design constraint is the location of Pump Station B. The station should be located such that most or all flows from contributing basins can be conveyed to the station by gravity pipelines. It should also have little or no impact on neighboring communities and avoid environmentally sensitive areas.

Field investigations were performed to determine suitable locations for Pump Station B. Several siting areas of interest are shown in Figure 250S-6. The general pump station siting area of interest is a low point in the service area along SR18 and SE 304th Street. The area surrounding the area of interest is largely developed. Further investigation into a suitable site should be conducted during the projects predesign phase.

CONSTRUCTION COST ESTIMATE

Table 250S-9 shows construction cost estimates for the working alternative. The cost estimates presented are based on Tabula. Pipeline costs include import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. Pump station estimates include assumptions for site/civil, electrical/instrumentation, architectural/structural, and mechanical components based on a fixed cost per mgd of flow pumped. The estimates are conservative and subject to reduction by refinement during predesign. The construction cost estimate for Pump Station B and Forcemain B is approximately \$6,005,000 million.

Table 250S-9. Estimated Construction Cost-Pump Station B and Conveyance to Point E

Working Alternative Project	Average Depth (ft)	Quantity	Unit	Estimated Construction Cost ^a (million dollars)
Pump Station B				
Pump Station B	-	1	LS	\$2,764,121
Forcemain B (open cut construction)				
16 inch	6	10,000	LF	\$3,240,529
Lift Station B Total				\$6,005,000

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

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Figure 250S-6. Pump Station B-Area of Interest

8 ½ x 11 color figure

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PLAN AND PROFILE SHEETS PUMP STATION B TO PUMP STATION D

3 sheets 11 x 17 color

Sheet 1

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PUMP STATION D AND CONVEYANCE TO POINT A

The fifth component project for the Soos Planning Zone working alternative includes a regional pump station (Pump Station D), Forcemain D, and a gravity trunk to convey flows from contributing basins to Point A as shown in Figure 250S-7. The project would convey flows delivered from Pump Stations B, F, and H as well as direct service area to the 277th Interceptor (Point A). Pump Station D would operate at about 151 feet total dynamic head. Conveyance to Point A includes approximately 16,200 feet of forcemain and 5,400 of gravity sewer. Forcemain D exits the site to the south along SR18 and is then routed west on SE 288th Street to 132nd Avenue SE. The forcemain continues north on 132nd Avenue SE, then west on SE 282nd Street. At 124th Avenue SE, the forcemain turns south to SE 284th Street and then west on SE 284th Street. Approximately half way between 118th Avenue SE and 124th Avenue SE, the pipeline transitions from forcemain to gravity sewer. The gravity sewer continues west to 118th Avenue SE, then north to SE 277th Place. At SE 277th Place, the gravity sewer turns west through an elementary school playground, is routed through a park, and finally reaches 114th Avenue SE. At 114th Avenue SE, the trunk turns north to its connection with the 277th Interceptor.

The following photographs depict existing conditions along the proposed forcemain and gravity trunk. The approximate location of each photo is indicated in Figure 250S-7. A brief description of access concerns for each representative section of the proposed alignment is included.

P1: SR18 – Pump Station D to SE 288th Street

Roadway and shoulder access must be maintained. SR18 is the best available roadway for routing the trunk alignment. SR18 offers the most direct route to Pump Station D.



P2: SE 288th St – SR18 to 132nd Avenue SE

Access to roadways and homes must be maintained.



P3: 132nd Avenue SE - SE 288th St to SE 282nd St

Access to roadways, homes, and businesses must be maintained.



P4: SE 282nd St - 132nd Avenue SE to 124th Avenue SE

Access to roadways and homes must be maintained.



P5: 124th Avenue SE - SE 282nd St to SE 284th St

Access to roadways and homes must be maintained. The pipeline's alignment does not continue along SE 282nd St because there appears to be a wetland area west of 124th Avenue SE.



P6: SE 284th St - 124th Avenue SE to 118th Avenue SE

Access to roadways and homes must be maintained.



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Figure 250S-7. Pump Station D and Conveyance to Point A

8 ½ x 11 color figure

Back page for figure 250S-7

P7: 118th Avenue SE - SE 284th St to SE 277th PI

Access to roadways and homes must be maintained.



P8: SE 277th PI - 118th Avenue SE to 114th Avenue SE

Access to the elementary school's parking lot and playground must be maintained.



P9: 114th Avenue SE - SE 277th PI to SE 274th St

Access to roadways and homes must be maintained.



The project alignment is shown on preliminary plan and profile sheets at the end of this project discussion.

PROJECT IMPACTS

Typical temporary construction related impacts may include increased noise, dust and construction vehicle traffic. Temporary partial road closures may be required. Trees and other vegetation may be impacted by pipeline and pump station excavation.

Impacts to citizens, businesses, and the environment are of concern with interceptor alignments. Access to neighboring residences and businesses must be maintained throughout construction. Impacts to traffic are expected.

Streams should not be impacted by construction. Jacking or tunneling pipeline construction methods would eliminate impacts to streams. A minimum separation of five feet is recommended between streambed and pipe crown in order to allow for natural streambed movement. Jacking and receiving pits should be placed away from the streambank to avoid erosion.

Table 250S-10 lists existing utilities and roadway characteristics observed during planning level field inspection along Pump Station D's conveyance alignment.

Table 250S-10. Existing Conditions-Pump Station D Conveyance Alignment.

														Roadway Type					Traffic Lanes		Parking Lanes	
Conveyance Component Alignment		UGT	Water	Sewer	Storm Drain	Gas	OHP	UGP	Bike Lanes	Sidewalk	Stream Crossing	Easement	Street Trees	Highway	Major Arterial	Secondary Arterial	Collector	Local	2	4	1	2
P4	SR18 – Pump Station D to SE 288th Street				x						x			x						x		
P5	SE 288 th St – SR18 to 132 nd Avenue SE		x				x				x		x					x	x			
P6	132 nd Avenue SE - SE 288 th St to SE 282 nd St		x		x		x				x		x			x			x			
P7	SE 282 nd St - 132 nd Avenue SE to 124 th Avenue SE		x		x		x				x		x				x		x			
P8	124 th Avenue SE - SE 282 nd St to SE 284 th St		x		x		x						x			x			x			
P9	SE 284 th St - 124 th Avenue SE to 118 th Avenue SE		x		x		x						x				x		x			
P10	118 th Avenue SE - SE 284 th St to SE 277 th PI		x		x		x						x				x		x			
P11	SE 277 th PI - 118 th Avenue SE to 114 th Avenue SE											x										
P12	114 th Avenue SE - SE 277 th PI to SE 274 th St		x		x			x					x					x	x			

PERMIT REQUIREMENTS

A ROW Use Permit from King County Roads Department is required for construction within the right of way. The discharge from dewatering operations may require a section 401 water quality certificate from the Washington Department of Ecology or a King County Industrial Waste Discharge Permit. A State Environmental Policy Act checklist is required. A building permit will be required for the pump station. A Hydraulic Project Approval will be required for non-tunneled stream crossings.

EASEMENT AND PROPERTY ACQUISITION

Property acquisitions will likely be required for Pump Station D. Predesign should include identification of suitable sites for Pump Station D.

OPERATION AND MAINTENANCE

Pump Station D's conveyance system includes a gravity sewer and forcemain. No routine or scheduled maintenance is anticipated for either type of pipeline.

Pump stations have specific O&M requirements depending on configuration, frequency of use, and other factors. In general, design considerations to reduce labor, parts replacement and downtime should be considered during predesign.

DESIGN ISSUES AND CONSTRAINTS

Constraints to be resolved during design include connection to the existing sewer, location of Pump Station D, railroad and stream crossings, and avoiding or relocating existing utilities. In general, provisions must be in place to provide access to homes and businesses along the alignment throughout construction. The operation of SR18 must be maintained throughout construction.

A major design constraint is the location of Pump Station D. The station should be located such that most or all flows from contributing basins can be conveyed to the station by gravity pipelines. It should also have little or no impact on neighboring communities and avoid environmentally sensitive areas.

Field investigations were performed to determine suitable locations for Pump Station D. Several siting areas of interest are shown in Figure 250S-8. The general pump station siting area of interest is a low point in the service area on the east side of SR18 at about SE 280th Street. Further investigation into a suitable site should be conducted during the projects predesign phase.

CONSTRUCTION COST ESTIMATE

Table 250S-11 shows construction cost estimates for the component project. The cost estimates presented are based on Tabula. Pipeline costs include import fill of trenches, relocation of existing utilities, dewatering, and pavement restoration throughout the project length. Pump

station estimates include assumptions for site/civil, electrical/instrumentation, architectural/structural, and mechanical components based on a fixed cost per mgd of flow pumped. The estimates are conservative and subject to reduction by refinement during predesign. The construction cost estimate for Pump Station D, gravity trunk, and Forcemain D is approximately \$19,083,000. The gravity sewer portion of this cost is about \$2,490,000, which is included in the Soos Gravity Sewers cost line item in Table 250S-1.

Table 250S-11. Estimated Construction Cost-Pump Station D and Conveyance to Point A.

Working Alternative Projects	Average Depth (ft)	Quantity	Unit	Estimated Construction Cost ^a (million dollars)
Pump Station D				
Pump Station D	—	1	LS	\$8,586,345
Forcemain D (open cut construction)				
36 inch	6	16,200	LF	\$8,005,771
Pipeline (open cut construction)				
15 inch	11	1,200	LF	\$494,204
21 inch	11	4,200	LF	\$1,996,269
Pump Station D Total				\$19,083,000

^a Cost estimate based on CSI cost model version 0.6.2. (2001 dollars)

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Figure 250S-8. Pump Station D-Area of Interest

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PLAN AND PROFILE SHEETS PUMP STATION D TO POINT A

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APPENDIX A

COST ESTIMATE DATA

Cost Calculations for Project: Soos

Project year: 2000

Assumptions

Project Year: 2000

Comments: NOTE: Previous versions of Tabula used to generate original cost estimates utilized a basis year of 2000. A project year of 2001 was chosen resulting in a projected inflation multiplier of one year. Version 0.6.2 now uses a basis year of 1999. In order to maintain a projected inflation multiplier of one year, a project year of 2000 was used. Jan 2000 ENR 7137 and June 2001 is 7329. $7329/7137 = 1.027$. Therefore 2.7% is used as a annual projected inflation multiplier.

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
Pump Station C	Pump Station	2000	5,163,840.83	1.00	5,163,840.83
Pump Station B	Pump Station	2000	2,764,121.42	1.00	2,764,121.42
FM B	Pipe	2000	3,240,529.29	1.00	3,240,529.29
Pump Station D	Pump Station	2000	8,586,345.72	1.00	8,586,345.72
FM D	Pipe	2000	8,005,771.31	1.00	8,005,771.31
Pump Station F	Pump Station	2000	4,876,689.01	1.00	4,876,689.01
FM F	Pipe	2000	1,369,139.04	1.00	1,369,139.04
Pump Station H	Pump Station	2000	2,326,962.02	1.00	2,326,962.02
FM H	Pipe	2000	273,309.02	1.00	273,309.02
Soos GS	Project	2000	0.00	1.00	0.00
21" gs psf	Pipe	2000	330,897.84	1.00	330,897.84
24" gs psf	Pipe	2000	1,096,293.26	1.00	1,096,293.26
27" gs psf	Pipe	2000	5,363,102.41	1.00	5,363,102.41
15" gs psd	Pipe	2000	494,204.01	1.00	494,204.01
21" gs psd	Pipe	2000	1,996,269.13	1.00	1,996,269.13
42" gs sr-18 (w/ 3 subs)	Pipe	2000	12,456,936.75	1.00	12,456,936.75
Black Diamond GS (w/ 5	Project	2000	17,696,533.57	1.00	17,696,533.57

subs)

Subtotal 76,040,944.64

Total: \$76,040,944.64

Cost Calculations for Pump Station: Pump Station C

Project year: 2000

Assumptions

Construction Year: 2000

Firm Capacity: 12 mgd

Total Dynamic Head: 183 ft

Excavation Depth: 30 ft

Calculated Parameters

Required Pump Power	755.743	Hp
Base Architectural/Structural Unit Cost	130,627.346	\$/mgd
Architectural/Structural Unit Cost Adjustment	1,050	\$/mgd
Base Mechanical Unit Cost	113,361.61	\$/mgd
Mechanical Unit Cost Adjustment	26,250	\$/mgd

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Site/Civil	1.00	LS	325,000.00	325,000.00
Electrical/Instrumentation	1.00	LS	1,447,615.13	1,447,615.13
Architectural/Structural	12.00	mgd	131,677.35	1,580,128.16
Mechanical	12.00	mgd	139,611.61	1,675,339.32
Year 1999 subtotal				5,028,082.60

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.03

Subtotal 5,163,840.83

Total: \$5,163,840.83

Cost Calculations for Pump Station: Pump Station B

Project year: 2000

Assumptions

Construction Year: 2000

Firm Capacity: 5 mgd

Total Dynamic Head: 135 ft

Excavation Depth: 30 ft

Calculated Parameters

Required Pump Power	232.298	Hp
Base Architectural/Structural Unit Cost	197,121.225	\$/mgd
Architectural/Structural Unit Cost Adjustment	250	\$/mgd
Base Mechanical Unit Cost	165,179.763	\$/mgd
Mechanical Unit Cost Adjustment	6,250	\$/mgd

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Site/Civil	1.00	LS	185,000.00	185,000.00
Electrical/Instrumentation	1.00	LS	662,447.27	662,447.27
Architectural/Structural	5.00	mgd	197,371.22	986,856.12
Mechanical	5.00	mgd	171,429.76	857,148.81
Year 1999 subtotal				2,691,452.21

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.03

Subtotal 2,764,121.42

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
FM B	Pipe	2000	3,240,529.29	1.00	3,240,529.29
					Subtotal 3,240,529.29

Total: \$6,004,650.71

Cost Calculations for Pipe: **FM B**

Project year: 2000

Assumptions

Construction Year: 2000
Length: 10000 ft
Conduit Type: Force Main
Depth of Cover: 6 ft
Trench Backfill Type: Imported
Manhole Spacing: None
Existing Utilities: Average
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 16 in.

Geometry

Outer Diameter	1.45	ft
Trench Width	4.385	ft
Excavation Depth	8.45	ft
Complete Surface Rest. Width	6.385	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	13,723.43	CY	10.00	137,234.26
Backfill	8,120.37	CY	25.00	203,009.26
Complete Pavement Restoration	7,094.44	SY	50.00	354,722.22
Overlay Pavement Restoration	17,350.00	SY	20.00	347,000.00
Trench Safety	169,000.00	SF	0.50	84,500.00
Spoil Load and Haul	13,723.43	CY	10.00	137,234.26
Pipe Unit Material Cost	10,000.00	lf	26.00	260,000.00
Pipe Installation	10,000.00	lf	22.00	220,000.00
Place Pipe Zone Fill	4,991.46	CY	25.00	124,786.58
Existing Utilities	10,000.00	lf	30.00	300,000.00
Dewatering	10,000.00	lf	60.00	600,000.00
Traffic Control	10,000.00	lf	10.00	100,000.00
Year 1999 subtotal				2,868,486.58

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	3,240,529.29
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Total: \$3,240,529.29

Cost Calculations for Pump Station: **Pump Station D**

Project year: 2000

Assumptions

Construction Year: 2000
Firm Capacity: 28.9 mgd
Total Dynamic Head: 151 ft
Excavation Depth: 30 ft

Calculated Parameters

Required Pump Power	1,501.816	Hp
Base Architectural/Structural Unit Cost	86,422.595	\$/mgd
Architectural/Structural Unit Cost Adjustment	516.667	\$/mgd
Base Mechanical Unit Cost	77,683.336	\$/mgd
Mechanical Unit Cost Adjustment	12,916.667	\$/mgd

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Site/Civil	1.00	LS	663,000.00	663,000.00
Electrical/Instrumentation	1.00	LS	2,566,724.52	2,566,724.52
Architectural/Structural	28.90	mgd	86,939.26	2,512,544.67
Mechanical	28.90	mgd	90,600.00	2,618,340.08
Year 1999 subtotal				8,360,609.27

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.03

Subtotal 8,586,345.72

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
FM D Pipe		2000	8,005,771.31	1.00	8,005,771.31
Subtotal					8,005,771.31

Total: \$16,592,117.03

Cost Calculations for Pipe: **FM D**

Project year: 2000

Assumptions

Construction Year: 2000

Length: 16200 ft

Conduit Type: Force Main
 Depth of Cover: 6 ft
 Trench Backfill Type: Imported
 Manhole Spacing: None
 Existing Utilities: Average
 Dewatering: Minimal
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Light
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 36 in.

Geometry

Outer Diameter	3.192 ft
Trench Width	6.649 ft
Excavation Depth	10.192 ft
Complete Surface Rest. Width	8.649 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	40,659.65	CY	10.00	406,596.54
Backfill	19,947.50	CY	25.00	498,687.50
Complete Pavement Restoration	15,568.50	SY	50.00	778,425.00
Overlay Pavement Restoration	24,031.50	SY	20.00	480,630.00
Trench Safety	330,210.00	SF	0.50	165,105.00
Spoil Load and Haul	40,659.65	CY	10.00	406,596.54
Pipe Unit Material Cost	16,200.00	lf	108.00	1,749,600.00
Pipe Installation	16,200.00	lf	54.00	874,800.00
Place Pipe Zone Fill	15,911.77	CY	25.00	397,794.20
Existing Utilities	16,200.00	lf	42.00	680,400.00
Dewatering	16,200.00	lf	30.00	486,000.00
Traffic Control	16,200.00	lf	10.00	162,000.00

Year 1999 subtotal 7,086,634.78

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13
Subtotal	8,005,771.31

Total: \$8,005,771.31

Cost Calculations for Pump Station: **Pump Station F**

Project year: 2000

Assumptions

Construction Year: 2000
 Firm Capacity: 12.3 mgd
 Total Dynamic Head: 152 ft
 Excavation Depth: 30 ft

Calculated Parameters

Required Pump Power	643.414	Hp
Base Architectural/Structural Unit Cost	129,120.11	\$/mgd
Architectural/Structural Unit Cost Adjustment	533.333	\$/mgd
Base Mechanical Unit Cost	112,164.324	\$/mgd
Mechanical Unit Cost Adjustment	13,333.333	\$/mgd

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Site/Civil	1.00	LS	331,000.00	331,000.00
Electrical/Instrumentation	1.00	LS	1,279,121.51	1,279,121.51
Architectural/Structural	12.30	mgd	129,653.44	1,594,737.36
Mechanical	12.30	mgd	125,497.66	1,543,621.18
Year 1999 subtotal				4,748,480.05

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
Effective Multiplier 1.03

Subtotal 4,876,689.01

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
FM F Pipe		2000	1,369,139.04	1.00	1,369,139.04
			Subtotal		1,369,139.04

Total: \$6,245,828.05

Cost Calculations for Pipe: **FM F**

Project year: 2000

Assumptions

Construction Year: 2000
Length: 4300 ft
Conduit Type: Force Main
Depth of Cover: 6 ft
Trench Backfill Type: Imported
Manhole Spacing: None
Existing Utilities: Average
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Light
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 16 in.

Geometry

Outer Diameter	1.45 ft
Trench Width	4.385 ft
Excavation Depth	8.45 ft
Complete Surface Rest. Width	6.385 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	5,901.07	CY	10.00	59,010.73
Backfill	3,491.76	CY	25.00	87,293.98
Complete Pavement Restoration	3,050.61	SY	50.00	152,530.56
Overlay Pavement Restoration	7,460.50	SY	20.00	149,210.00
Trench Safety	72,670.00	SF	0.50	36,335.00
Spoil Load and Haul	5,901.07	CY	10.00	59,010.73
Pipe Unit Material Cost	4,300.00	lf	26.00	111,800.00
Pipe Installation	4,300.00	lf	22.00	94,600.00
Place Pipe Zone Fill	2,146.33	CY	25.00	53,658.23
Existing Utilities	4,300.00	lf	30.00	129,000.00
Dewatering	4,300.00	lf	60.00	258,000.00
Traffic Control	4,300.00	lf	5.00	21,500.00
Year 1999 subtotal				1,211,949.23

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,369,139.04
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Total: \$1,369,139.04

Cost Calculations for Pump Station: **Pump Station H**

Project year: 2000

Assumptions

Construction Year: 2000
 Firm Capacity: 5.3 mgd
 Total Dynamic Head: 33 ft
 Excavation Depth: 30 ft

Calculated Parameters

Required Pump Power	60.191	Hp
Base Architectural/Structural Unit Cost	191,796.038	\$/mgd
Architectural/Structural Unit Cost Adjustment	-1,450	\$/mgd
Base Mechanical Unit Cost	161,092.498	\$/mgd
Mechanical Unit Cost Adjustment	-36,250	\$/mgd

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Site/Civil	1.00	LS	191,000.00	191,000.00
Electrical/Instrumentation	1.00	LS	404,286.56	404,286.56
Architectural/Structural	5.30	mgd	190,346.04	1,008,834.00
Mechanical	5.30	mgd	124,842.50	661,665.24
Year 1999 subtotal				2,265,785.80

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.03

Subtotal 2,326,962.02

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
FM H Pipe		2000	273,309.02	1.00	273,309.02
Subtotal					273,309.02

Total: \$2,600,271.04

Cost Calculations for Pipe: **FM H**

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1000 ft
Conduit Type: Force Main
Depth of Cover: 6 ft
Trench Backfill Type: Imported
Manhole Spacing: None
Existing Utilities: Average
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 12 in.

Geometry

Outer Diameter 1.1 ft
Trench Width 3.93 ft
Excavation Depth 8.1 ft
Complete Surface Rest. Width 5.93 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	1,179.00	CY	10.00	11,790.00
Backfill	727.78	CY	25.00	18,194.44
Complete Pavement Restoration	658.89	SY	50.00	32,944.44
Overlay Pavement Restoration	1,785.56	SY	20.00	35,711.11
Trench Safety	16,200.00	SF	0.50	8,100.00
Spoil Load and Haul	1,179.00	CY	10.00	11,790.00

Pipe Unit Material Cost	1,000.00	If	18.00	18,000.00
Pipe Installation	1,000.00	If	15.00	15,000.00
Place Pipe Zone Fill	416.02	CY	25.00	10,400.62
Existing Utilities	1,000.00	If	20.00	20,000.00
Dewatering	1,000.00	If	50.00	50,000.00
Traffic Control	1,000.00	If	10.00	10,000.00
Year 1999 subtotal				241,930.62

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	273,309.02
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Total: \$273,309.02

Cost Calculations for Project: Soos GS

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
21" gs psf	Pipe	2000	330,897.84	1.00	330,897.84
24" gs psf	Pipe	2000	1,096,293.26	1.00	1,096,293.26
27" gs psf	Pipe	2000	5,363,102.41	1.00	5,363,102.41
15" gs psd	Pipe	2000	494,204.01	1.00	494,204.01
21" gs psd	Pipe	2000	1,996,269.13	1.00	1,996,269.13
42" gs sr-18	Pipe	2000	3,389,162.74	1.00	3,389,162.74
24" gs sr-18	Pipe	2000	366,943.04	1.00	366,943.04

27" gs sr-18	Pipe	2000	870,438.77	1.00	870,438.77
Microtunnel 42" gs sr-18	Microtunnel	2000	7,830,392.19	1.00	7,830,392.19
Black Diamond GS	Project	2000	0.00	1.00	0.00
21" (w/ 20 subs)	Project	2000	13,946,905.75	1.00	13,946,905.75
18" (w/ 6 subs)	Project	2000	3,101,166.75	1.00	3,101,166.75
15" (with 1 sub)	Project	2000	373,653.16	1.00	373,653.16
12" (w/ 2 subs)	Project	2000	140,955.65	1.00	140,955.65
10" (w/ 2 subs)	Project	2000	133,852.25	1.00	133,852.25
Subtotal					39,434,236.98

Total: \$39,434,236.98

Cost Calculations for Pipe: **21" gs psf**

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 600 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 17 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft

Excavation Depth 20.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,411.90	CY	10.00	24,119.02
Backfill	1,909.63	CY	25.00	47,740.74
Complete Pavement Restoration	491.39	SY	50.00	24,569.44
Overlay Pavement Restoration	975.28	SY	20.00	19,505.56
Trench Safety	24,250.00	SF	0.50	12,125.00
Spoil Load and Haul	2,411.90	CY	10.00	24,119.02
Pipe Unit Material Cost	600.00	lf	26.00	15,600.00
Pipe Installation	600.00	lf	27.00	16,200.00
Place Pipe Zone Fill	417.16	CY	25.00	10,428.93
Manholes	2.00	MH	4,250.00	8,500.00
Existing Utilities	600.00	lf	80.00	48,000.00
Dewatering	600.00	lf	60.00	36,000.00
Traffic Control	600.00	lf	10.00	6,000.00
Year 1999 subtotal				292,907.71

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal 330,897.84

Total: \$330,897.84

Cost Calculations for Pipe: 24" gs psf

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 1750 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 19 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 24 in.

Geometry

Outer Diameter	2.5 ft
Trench Width	5.75 ft
Excavation Depth	22.5 ft
Complete Surface Rest. Width	7.75 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	8,385.42	CY	10.00	83,854.17
Backfill	6,708.33	CY	25.00	167,708.33
Complete Pavement Restoration	1,506.94	SY	50.00	75,347.22
Overlay Pavement Restoration	2,770.83	SY	20.00	55,416.67
Trench Safety	78,750.00	SF	0.50	39,375.00
Spoil Load and Haul	8,385.42	CY	10.00	83,854.17
Pipe Unit Material Cost	1,750.00	lf	30.00	52,500.00
Pipe Installation	1,750.00	lf	30.00	52,500.00
Place Pipe Zone Fill	1,358.92	CY	25.00	33,973.11
Manholes	4.00	MH	7,100.00	28,400.00
Existing Utilities	1,750.00	lf	80.00	140,000.00

Dewatering	1,750.00	If	70.00	122,500.00
Traffic Control	1,750.00	If	20.00	35,000.00
Year 1999 subtotal				970,428.66

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,096,293.26
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Total: \$1,096,293.26

Cost Calculations for Pipe: 27" gs psf

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 9300 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 13 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 27 in.

Geometry

Outer Diameter	2.792	ft
Trench Width	6.129	ft
Excavation Depth	16.792	ft
Complete Surface Rest. Width	8.129	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	35,449.85	CY	10.00	354,498.51
Backfill	25,333.89	CY	25.00	633,347.22
Complete Pavement Restoration	8,400.14	SY	50.00	420,006.94
Overlay Pavement Restoration	14,333.19	SY	20.00	286,663.89
Trench Safety	312,325.00	SF	0.50	156,162.50
Spoil Load and Haul	35,449.85	CY	10.00	354,498.51
Pipe Unit Material Cost	9,300.00	lf	36.00	334,800.00
Pipe Installation	9,300.00	lf	35.00	325,500.00
Place Pipe Zone Fill	8,007.64	CY	25.00	200,191.11
Manholes	19.00	MH	5,300.00	100,700.00
Existing Utilities	9,300.00	lf	80.00	744,000.00
Dewatering	9,300.00	lf	70.00	651,000.00
Traffic Control	9,300.00	lf	20.00	186,000.00
Year 1999 subtotal				4,747,368.69

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	5,363,102.41
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Total: \$5,363,102.41

Cost Calculations for Pipe: 15" gs psd

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1200 ft
Conduit Type: Gravity Sewer
Depth of Cover: 11 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 15 in.

Geometry

Outer Diameter	1.667	ft
Trench Width	4.667	ft
Excavation Depth	13.667	ft
Complete Surface Rest. Width	6.667	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,834.57	CY	10.00	28,345.68
Backfill	2,074.07	CY	25.00	51,851.85
Complete Pavement Restoration	888.89	SY	50.00	44,444.44
Overlay Pavement Restoration	2,044.44	SY	20.00	40,888.89
Trench Safety	32,800.00	SF	0.50	16,400.00
Spoil Load and Haul	2,834.57	CY	10.00	28,345.68
Pipe Unit Material Cost	1,200.00	lf	18.00	21,600.00
Pipe Installation	1,200.00	lf	20.00	24,000.00
Place Pipe Zone Fill	663.53	CY	25.00	16,588.28
Manholes	3.00	MH	3,000.00	9,000.00

Existing Utilities	1,200.00	If	60.00	72,000.00
Dewatering	1,200.00	If	60.00	72,000.00
Traffic Control	1,200.00	If	10.00	12,000.00
Year 1999 subtotal				437,464.82

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	494,204.01
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Total: \$494,204.01

Cost Calculations for Pipe: **21" gs psd**

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 4200 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 11 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter	2.208	ft
Trench Width	5.371	ft
Excavation Depth	14.208	ft
Complete Surface Rest. Width	7.371	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	11,870.54	CY	10.00	118,705.36
Backfill	8,354.63	CY	25.00	208,865.74
Complete Pavement Restoration	3,439.72	SY	50.00	171,986.11
Overlay Pavement Restoration	6,826.94	SY	20.00	136,538.89
Trench Safety	119,350.00	SF	0.50	59,675.00
Spoil Load and Haul	11,870.54	CY	10.00	118,705.36
Pipe Unit Material Cost	4,200.00	lf	26.00	109,200.00
Pipe Installation	4,200.00	lf	27.00	113,400.00
Place Pipe Zone Fill	2,920.10	CY	25.00	73,002.52
Manholes	9.00	MH	3,000.00	27,000.00
Existing Utilities	4,200.00	lf	80.00	336,000.00
Dewatering	4,200.00	lf	60.00	252,000.00
Traffic Control	4,200.00	lf	10.00	42,000.00
Year 1999 subtotal				1,767,078.99

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,996,269.13
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Total: \$1,996,269.13

Cost Calculations for Pipe: **42" gs sr-18**

Project year: 2000

Assumptions

Construction Year: 2000
Length: 4000 ft
Conduit Type: Gravity Sewer
Depth of Cover: 17 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 42 in.

Geometry

Outer Diameter	4.25	ft
Trench Width	8.025	ft
Excavation Depth	22.25	ft
Complete Surface Rest. Width	10.025	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	26,452.78	CY	10.00	264,527.78
Backfill	19,022.22	CY	25.00	475,555.56
Complete Pavement Restoration	4,455.56	SY	50.00	222,777.78
Overlay Pavement Restoration	5,322.22	SY	20.00	106,444.44
Trench Safety	178,000.00	SF	0.50	89,000.00
Spoil Load and Haul	26,452.78	CY	10.00	264,527.78
Pipe Unit Material Cost	4,000.00	lf	78.00	312,000.00
Pipe Installation	4,000.00	lf	60.00	240,000.00
Place Pipe Zone Fill	5,328.89	CY	25.00	133,222.21
Manholes	8.00	MH	11,500.00	92,000.00

Existing Utilities	4,000.00	If	100.00	400,000.00
Dewatering	4,000.00	If	80.00	320,000.00
Traffic Control	4,000.00	If	20.00	80,000.00
Year 1999 subtotal				3,000,055.54

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	3,389,162.74
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Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
24" gs sr-18	Pipe	2000	366,943.04	1.00	366,943.04
27" gs sr-18	Pipe	2000	870,438.77	1.00	870,438.77
Microtunnel 42" gs sr-18	Microtunnel	2000	7,830,392.19	1.00	7,830,392.19
Subtotal					9,067,774.01

Total: \$12,456,936.75

Cost Calculations for Pipe: **24" gs sr-18**

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 600 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 13 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant

Pavement Restoration: Full Width - Arterial (44 ft)

Traffic: Heavy

Right of Way: None

Required Easements: None

Trench Safety: Standard

Pipe Diameter: 24 in.

Geometry

Outer Diameter 2.5 ft

Trench Width 5.75 ft

Excavation Depth 16.5 ft

Complete Surface Rest. Width 7.75 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,108.33	CY	10.00	21,083.33
Backfill	1,533.33	CY	25.00	38,333.33
Complete Pavement Restoration	516.67	SY	50.00	25,833.33
Overlay Pavement Restoration	2,416.67	SY	20.00	48,333.33
Trench Safety	19,800.00	SF	0.50	9,900.00
Spoil Load and Haul	2,108.33	CY	10.00	21,083.33
Pipe Unit Material Cost	600.00	lf	30.00	18,000.00
Pipe Installation	600.00	lf	30.00	18,000.00
Place Pipe Zone Fill	465.92	CY	25.00	11,647.92
Manholes	2.00	MH	5,300.00	10,600.00
Existing Utilities	600.00	lf	80.00	48,000.00
Dewatering	600.00	lf	70.00	42,000.00
Traffic Control	600.00	lf	20.00	12,000.00

Year 1999 subtotal 324,814.59

Mobilization/Demobilization at 10% 1.10

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.13

Subtotal

366,943.04

Total: \$366,943.04

Cost Calculations for Pipe: 27" gs sr-18

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1500 ft
Conduit Type: Gravity Sewer
Depth of Cover: 9 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 27 in.

Geometry

Outer Diameter	2.792	ft
Trench Width	6.129	ft
Excavation Depth	12.792	ft
Complete Surface Rest. Width	8.129	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,355.68	CY	10.00	43,556.81

Backfill	2,724.07	CY	25.00	68,101.85
Complete Pavement Restoration	1,354.86	SY	50.00	67,743.06
Overlay Pavement Restoration	5,978.47	SY	20.00	119,569.44
Trench Safety	38,375.00	SF	0.50	19,187.50
Spoil Load and Haul	4,355.68	CY	10.00	43,556.81
Pipe Unit Material Cost	1,500.00	lf	36.00	54,000.00
Pipe Installation	1,500.00	lf	35.00	52,500.00
Place Pipe Zone Fill	1,291.56	CY	25.00	32,288.89
Manholes	3.00	MH	5,000.00	15,000.00
Existing Utilities	1,500.00	lf	80.00	120,000.00
Dewatering	1,500.00	lf	70.00	105,000.00
Traffic Control	1,500.00	lf	20.00	30,000.00
Year 1999 subtotal				770,504.36

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	870,438.77
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Total: \$870,438.77

Cost Calculations for Microtunnel: Microtunnel 42" gs sr-18

Project year: 2000

Assumptions

Construction Year: 2000
Inside Diameter: 42 in.
Length: 6000 ft
Dewatering: Significant
Launch Shaft Utilities: Average
Launch Shaft Excavation Depth: 25 ft
Launch Shaft Surface Restoration: Pavement

Retrieval Shaft Excavation Depth: 25 ft
Retrieval Shaft Surface Restoration: Pavement
Retrieval Shaft Utilities: Average
Tunnel Easment Length: 0 ft
Easment Type: None
Traffic: Heavy
Casing Required: false
Number of Intermediate Shafts: 1
Intermediate Shaft Utilities: Complex
Intermediate Shaft Excavation Depth: 38 ft
Intermediate Shaft Surface Restoration: Pavement

Tunnel Geometry

Outer Diameter	4.25	ft
Spoils Volume	3,152.501	CY
Casing Pipe Diameter	N/A	in

Launch Shaft Geometry

Width	19	ft
Length	32	ft
Footprint	608	SF
Volume	562.963	CY
Easment Footprint	5,658	SF

Retrieval Shaft Geometry

Width	23	ft
Length	23	ft
Footprint	529	SF
Volume	489.815	CY
Easment Footprint	5,329	SF

Miscellaneous

Spoils Loads 316 loads

Intermediate Shaft Geometry

Width	19	ft
Length	32	ft
Footprint	608	SF
Volume	562.963	CY
Easment Footprint	5,658	SF

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Spoils Haul	3,152.50	CY	25.00	78,812.52
Launch Shaft Excavation	562.96	CY	25.00	14,074.07
Launch Shaft Shoring	2,550.00	SF	49.00	124,950.00
Launch Shaft Utilities	608.00	SF	6.00	3,648.00
Launch Shaft Backfill	562.96	CY	25.00	14,074.07
Launch Shaft Surface Restoration	67.56	SY	50.00	3,377.78
Retrieval Shaft Excavation	489.81	CY	25.00	12,245.37
Retrieval Shaft Shoring	2,300.00	SF	49.00	112,700.00
Retrieval Shaft Utilities	529.00	SF	6.00	3,174.00
Retrieval Shaft Backfill	489.81	CY	25.00	12,245.37
Retrieval Shaft Surface Restoration	58.78	SY	50.00	2,938.89
Intermediate Shaft Excavation	562.96	CY	25.00	14,074.07
Intermediate Shaft Shoring	3,876.00	SF	69.80	270,544.80
Intermediate Shaft Utilities	608.00	SF	10.00	6,080.00
Intermediate Shaft Backfill	562.96	CY	25.00	14,074.07
Intermediate Shaft Surface Restoration	67.56	SY	50.00	3,377.78
MTBM Fixed Costs	1.00	LS	300,000.00	300,000.00
Microtunnel Boring	6,000.00	ft	966.00	5,796,000.00
Tunnel Dewatering	1.00	LS	70,000.00	70,000.00
Traffic Control	3.00	shaft	25,000.00	75,000.00
Year 1999 subtotal				6,931,390.81

Mobilization/Demobilization at 10% 1.10

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.13

Subtotal 7,830,392.19

Total: \$7,830,392.19

Cost Calculations for Project: Black Diamond GS

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
21"	Project	2000	0.00	1.00	0.00
21" @30' Pipe		2000	317,957.81	1.00	317,957.81
21" @28' Pipe		2000	501,597.62	1.00	501,597.62
21" @26' Pipe		2000	817,715.13	1.00	817,715.13
21" @25' Pipe		2000	326,970.25	1.00	326,970.25
21" @24' Pipe		2000	495,536.42	1.00	495,536.42
21" @23' Pipe		2000	585,603.46	1.00	585,603.46
21" @19' Pipe		2000	690,625.12	1.00	690,625.12
21" @17' Pipe		2000	276,533.39	1.00	276,533.39
21" @16' Pipe		2000	1,413,346.04	1.00	1,413,346.04
21" @15' Pipe		2000	332,368.37	1.00	332,368.37
21" @13' Pipe		2000	676,834.17	1.00	676,834.17
21" @12' Pipe		2000	1,107,349.33	1.00	1,107,349.33
21" @11' Pipe		2000	108,043.02	1.00	108,043.02
21" @10' Pipe		2000	919,845.10	1.00	919,845.10
21" @9' Pipe		2000	839,852.36	1.00	839,852.36
21" @8' Pipe		2000	1,283,356.43	1.00	1,283,356.43
21" @7' Pipe		2000	232,973.70	1.00	232,973.70
21" @6' Pipe		2000	1,011,781.54	1.00	1,011,781.54

21" @5'	Pipe	2000	126,459.71	1.00	126,459.71
21" @4'	Pipe	2000	1,882,156.80	1.00	1,882,156.80
18"	Project	2000	0.00	1.00	0.00
18" @10'	Pipe	2000	211,196.89	1.00	211,196.89
18" @9'	Pipe	2000	492,221.32	1.00	492,221.32
18" @7'	Pipe	2000	195,404.63	1.00	195,404.63
18" @6'	Pipe	2000	898,412.30	1.00	898,412.30
18" @5'	Pipe	2000	779,192.38	1.00	779,192.38
18" @4'	Pipe	2000	524,739.23	1.00	524,739.23
15"	Project	2000	0.00	1.00	0.00
15" @11'	Pipe	2000	373,653.16	1.00	373,653.16
12"	Project	2000	0.00	1.00	0.00
12" @7'	Pipe	2000	117,211.24	1.00	117,211.24
12" @4'	Pipe	2000	23,744.41	1.00	23,744.41
10"	Project	2000	0.00	1.00	0.00
10" @7'	Pipe	2000	111,121.32	1.00	111,121.32
10" @4'	Pipe	2000	22,730.94	1.00	22,730.94
Subtotal					17,696,533.57

Total: \$17,696,533.57

Cost Calculations for Project: 21"

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
21" @30'	Pipe	2000	317,957.81	1.00	317,957.81
21" @28'	Pipe	2000	501,597.62	1.00	501,597.62
21" @26'	Pipe	2000	817,715.13	1.00	817,715.13
21" @25'	Pipe	2000	326,970.25	1.00	326,970.25

21" @24' Pipe	2000	495,536.42	1.00	495,536.42
21" @23' Pipe	2000	585,603.46	1.00	585,603.46
21" @19' Pipe	2000	690,625.12	1.00	690,625.12
21" @17' Pipe	2000	276,533.39	1.00	276,533.39
21" @16' Pipe	2000	1,413,346.04	1.00	1,413,346.04
21" @15' Pipe	2000	332,368.37	1.00	332,368.37
21" @13' Pipe	2000	676,834.17	1.00	676,834.17
21" @12' Pipe	2000	1,107,349.33	1.00	1,107,349.33
21" @11' Pipe	2000	108,043.02	1.00	108,043.02
21" @10' Pipe	2000	919,845.10	1.00	919,845.10
21" @9' Pipe	2000	839,852.36	1.00	839,852.36
21" @8' Pipe	2000	1,283,356.43	1.00	1,283,356.43
21" @7' Pipe	2000	232,973.70	1.00	232,973.70
21" @6' Pipe	2000	1,011,781.54	1.00	1,011,781.54
21" @5' Pipe	2000	126,459.71	1.00	126,459.71
21" @4' Pipe	2000	1,882,156.80	1.00	1,882,156.80
Subtotal				13,946,905.75

Total: \$13,946,905.75

Cost Calculations for Pipe: **21" @30'**

Project year: 2000

Assumptions

Construction Year: 2000

Length: 420 ft

Conduit Type: Gravity Sewer

Depth of Cover: 30 ft

Trench Backfill Type: Imported

Manhole Spacing: Average (500 ft)

Existing Utilities: Complex

Dewatering: Significant

Pavement Restoration: Full Width - Arterial (44 ft)

Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 33.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,774.43	CY	10.00	27,744.33
Backfill	2,422.84	CY	25.00	60,571.06
Complete Pavement Restoration	343.97	SY	50.00	17,198.61
Overlay Pavement Restoration	1,709.36	SY	20.00	34,187.22
Trench Safety	27,895.00	SF	0.50	13,947.50
Spoil Load and Haul	2,774.43	CY	10.00	27,744.33
Pipe Unit Material Cost	420.00	lf	26.00	10,920.00
Pipe Installation	420.00	lf	27.00	11,340.00
Place Pipe Zone Fill	292.01	CY	25.00	7,300.25
Manholes	1.00	MH	7,500.00	7,500.00
Existing Utilities	420.00	lf	80.00	33,600.00
Dewatering	420.00	lf	60.00	25,200.00
Traffic Control	420.00	lf	10.00	4,200.00

Year 1999 subtotal 281,453.32

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	317,957.81
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Total: \$317,957.81

Cost Calculations for Pipe: 21" @28'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 680 ft
Conduit Type: Gravity Sewer
Depth of Cover: 28 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 31.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,221.41	CY	10.00	42,214.09
Backfill	3,652.17	CY	25.00	91,304.17
Complete Pavement Restoration	556.91	SY	50.00	27,845.37
Overlay Pavement Restoration	2,767.54	SY	20.00	55,350.74

Trench Safety	42,443.33	SF	0.50	21,221.67
Spoil Load and Haul	4,221.41	CY	10.00	42,214.09
Pipe Unit Material Cost	680.00	lf	26.00	17,680.00
Pipe Installation	680.00	lf	27.00	18,360.00
Place Pipe Zone Fill	472.78	CY	25.00	11,819.46
Manholes	2.00	MH	7,000.00	14,000.00
Existing Utilities	680.00	lf	80.00	54,400.00
Dewatering	680.00	lf	60.00	40,800.00
Traffic Control	680.00	lf	10.00	6,800.00
Year 1999 subtotal				444,009.57

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	501,597.62
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Total: \$501,597.62

Cost Calculations for Pipe: 21" @26'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1150 ft
Conduit Type: Gravity Sewer
Depth of Cover: 26 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 29.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	6,681.63	CY	10.00	66,816.32
Backfill	5,718.94	CY	25.00	142,973.57
Complete Pavement Restoration	941.83	SY	50.00	47,091.44
Overlay Pavement Restoration	4,680.39	SY	20.00	93,607.87
Trench Safety	67,179.17	SF	0.50	33,589.58
Spoil Load and Haul	6,681.63	CY	10.00	66,816.32
Pipe Unit Material Cost	1,150.00	lf	26.00	29,900.00
Pipe Installation	1,150.00	lf	27.00	31,050.00
Place Pipe Zone Fill	799.55	CY	25.00	19,988.79
Manholes	3.00	MH	6,500.00	19,500.00
Existing Utilities	1,150.00	lf	80.00	92,000.00
Dewatering	1,150.00	lf	60.00	69,000.00
Traffic Control	1,150.00	lf	10.00	11,500.00
Year 1999 subtotal				723,833.88

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 817,715.13

Total: \$817,715.13

Cost Calculations for Pipe: 21" @25'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 470 ft
Conduit Type: Gravity Sewer
Depth of Cover: 25 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 28.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,637.26	CY	10.00	26,372.62
Backfill	2,243.81	CY	25.00	56,095.37
Complete Pavement Restoration	384.92	SY	50.00	19,246.06
Overlay Pavement Restoration	1,912.86	SY	20.00	38,257.13

Trench Safety	26,515.83	SF	0.50	13,257.92
Spoil Load and Haul	2,637.26	CY	10.00	26,372.62
Pipe Unit Material Cost	470.00	lf	26.00	12,220.00
Pipe Installation	470.00	lf	27.00	12,690.00
Place Pipe Zone Fill	326.77	CY	25.00	8,169.33
Manholes	1.00	MH	6,250.00	6,250.00
Existing Utilities	470.00	lf	80.00	37,600.00
Dewatering	470.00	lf	60.00	28,200.00
Traffic Control	470.00	lf	10.00	4,700.00
Year 1999 subtotal				289,431.04

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	326,970.25
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Total: \$326,970.25

Cost Calculations for Pipe: 21" @24'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 720 ft
Conduit Type: Gravity Sewer
Depth of Cover: 24 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 27.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	3,896.84	CY	10.00	38,968.38
Backfill	3,294.11	CY	25.00	82,352.78
Complete Pavement Restoration	589.67	SY	50.00	29,483.33
Overlay Pavement Restoration	2,930.33	SY	20.00	58,606.67
Trench Safety	39,180.00	SF	0.50	19,590.00
Spoil Load and Haul	3,896.84	CY	10.00	38,968.38
Pipe Unit Material Cost	720.00	lf	26.00	18,720.00
Pipe Installation	720.00	lf	27.00	19,440.00
Place Pipe Zone Fill	500.59	CY	25.00	12,514.72
Manholes	2.00	MH	6,000.00	12,000.00
Existing Utilities	720.00	lf	80.00	57,600.00
Dewatering	720.00	lf	60.00	43,200.00
Traffic Control	720.00	lf	10.00	7,200.00

Year 1999 subtotal 438,644.26

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	495,536.42
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Total: \$495,536.42

Cost Calculations for Pipe: 21" @23'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 870 ft
Conduit Type: Gravity Sewer
Depth of Cover: 23 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 26.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,535.62	CY	10.00	45,356.19
Backfill	3,807.32	CY	25.00	95,183.10
Complete Pavement Restoration	712.51	SY	50.00	35,625.69
Overlay Pavement Restoration	3,540.82	SY	20.00	70,816.39

Trench Safety	45,602.50	SF	0.50	22,801.25
Spoil Load and Haul	4,535.62	CY	10.00	45,356.19
Pipe Unit Material Cost	870.00	lf	26.00	22,620.00
Pipe Installation	870.00	lf	27.00	23,490.00
Place Pipe Zone Fill	604.88	CY	25.00	15,121.95
Manholes	2.00	MH	5,750.00	11,500.00
Existing Utilities	870.00	lf	80.00	69,600.00
Dewatering	870.00	lf	60.00	52,200.00
Traffic Control	870.00	lf	10.00	8,700.00
Year 1999 subtotal				518,370.77

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	585,603.46
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Total: \$585,603.46

Cost Calculations for Pipe: 21" @19'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1100 ft
Conduit Type: Gravity Sewer
Depth of Cover: 19 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 22.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,859.44	CY	10.00	48,594.44
Backfill	3,938.61	CY	25.00	98,465.28
Complete Pavement Restoration	900.88	SY	50.00	45,043.98
Overlay Pavement Restoration	4,476.90	SY	20.00	89,537.96
Trench Safety	48,858.33	SF	0.50	24,429.17
Spoil Load and Haul	4,859.44	CY	10.00	48,594.44
Pipe Unit Material Cost	1,100.00	lf	26.00	28,600.00
Pipe Installation	1,100.00	lf	27.00	29,700.00
Place Pipe Zone Fill	764.79	CY	25.00	19,119.71
Manholes	3.00	MH	4,750.00	14,250.00
Existing Utilities	1,100.00	lf	80.00	88,000.00
Dewatering	1,100.00	lf	60.00	66,000.00
Traffic Control	1,100.00	lf	10.00	11,000.00
Year 1999 subtotal				611,334.97

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	690,625.12
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Total: \$690,625.12

Cost Calculations for Pipe: 21" @17'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 460 ft
Conduit Type: Gravity Sewer
Depth of Cover: 17 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 20.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	1,849.12	CY	10.00	18,491.25
Backfill	1,464.05	CY	25.00	36,601.23
Complete Pavement Restoration	376.73	SY	50.00	18,836.57
Overlay Pavement Restoration	1,872.16	SY	20.00	37,443.15

Trench Safety	18,591.67	SF	0.50	9,295.83
Spoil Load and Haul	1,849.12	CY	10.00	18,491.25
Pipe Unit Material Cost	460.00	lf	26.00	11,960.00
Pipe Installation	460.00	lf	27.00	12,420.00
Place Pipe Zone Fill	319.82	CY	25.00	7,995.51
Manholes	1.00	MH	4,250.00	4,250.00
Existing Utilities	460.00	lf	80.00	36,800.00
Dewatering	460.00	lf	60.00	27,600.00
Traffic Control	460.00	lf	10.00	4,600.00
Year 1999 subtotal				244,784.80

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	276,533.39
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Total: \$276,533.39

Cost Calculations for Pipe: 21" @16'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 2400 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 16 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 19.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	9,170.20	CY	10.00	91,702.01
Backfill	7,161.11	CY	25.00	179,027.78
Complete Pavement Restoration	1,965.56	SY	50.00	98,277.78
Overlay Pavement Restoration	9,767.78	SY	20.00	195,355.56
Trench Safety	92,200.00	SF	0.50	46,100.00
Spoil Load and Haul	9,170.20	CY	10.00	91,702.01
Pipe Unit Material Cost	2,400.00	lf	26.00	62,400.00
Pipe Installation	2,400.00	lf	27.00	64,800.00
Place Pipe Zone Fill	1,668.63	CY	25.00	41,715.73
Manholes	5.00	MH	4,000.00	20,000.00
Existing Utilities	2,400.00	lf	80.00	192,000.00
Dewatering	2,400.00	lf	60.00	144,000.00
Traffic Control	2,400.00	lf	10.00	24,000.00
Year 1999 subtotal				1,251,080.85

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 1,413,346.04

Total: \$1,413,346.04

Cost Calculations for Pipe: 21" @15'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 570 ft
Conduit Type: Gravity Sewer
Depth of Cover: 15 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 18.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,064.54	CY	10.00	20,645.38
Backfill	1,587.38	CY	25.00	39,684.49
Complete Pavement Restoration	466.82	SY	50.00	23,340.97
Overlay Pavement Restoration	2,319.85	SY	20.00	46,396.94

Trench Safety	20,757.50	SF	0.50	10,378.75
Spoil Load and Haul	2,064.54	CY	10.00	20,645.38
Pipe Unit Material Cost	570.00	lf	26.00	14,820.00
Pipe Installation	570.00	lf	27.00	15,390.00
Place Pipe Zone Fill	396.30	CY	25.00	9,907.49
Manholes	2.00	MH	3,750.00	7,500.00
Existing Utilities	570.00	lf	80.00	45,600.00
Dewatering	570.00	lf	60.00	34,200.00
Traffic Control	570.00	lf	10.00	5,700.00
Year 1999 subtotal				294,209.41

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	332,368.37
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Total: \$332,368.37

Cost Calculations for Pipe: 21" @13'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1220 ft
Conduit Type: Gravity Sewer
Depth of Cover: 13 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 16.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	3,933.47	CY	10.00	39,334.72
Backfill	2,912.19	CY	25.00	72,804.63
Complete Pavement Restoration	999.16	SY	50.00	49,957.87
Overlay Pavement Restoration	4,965.29	SY	20.00	99,305.74
Trench Safety	39,548.33	SF	0.50	19,774.17
Spoil Load and Haul	3,933.47	CY	10.00	39,334.72
Pipe Unit Material Cost	1,220.00	lf	26.00	31,720.00
Pipe Installation	1,220.00	lf	27.00	32,940.00
Place Pipe Zone Fill	848.22	CY	25.00	21,205.49
Manholes	3.00	MH	3,250.00	9,750.00
Existing Utilities	1,220.00	lf	80.00	97,600.00
Dewatering	1,220.00	lf	60.00	73,200.00
Traffic Control	1,220.00	lf	10.00	12,200.00
Year 1999 subtotal				599,127.35

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 676,834.17

Total: \$676,834.17

Cost Calculations for Pipe: 21" @12'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 2040 ft
Conduit Type: Gravity Sewer
Depth of Cover: 12 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 15.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	6,171.49	CY	10.00	61,714.85
Backfill	4,463.76	CY	25.00	111,593.98
Complete Pavement Restoration	1,670.72	SY	50.00	83,536.11
Overlay Pavement Restoration	8,302.61	SY	20.00	166,052.22

Trench Safety	62,050.00	SF	0.50	31,025.00
Spoil Load and Haul	6,171.49	CY	10.00	61,714.85
Pipe Unit Material Cost	2,040.00	lf	26.00	53,040.00
Pipe Installation	2,040.00	lf	27.00	55,080.00
Place Pipe Zone Fill	1,418.33	CY	25.00	35,458.37
Manholes	5.00	MH	3,000.00	15,000.00
Existing Utilities	2,040.00	lf	80.00	163,200.00
Dewatering	2,040.00	lf	60.00	122,400.00
Traffic Control	2,040.00	lf	10.00	20,400.00
Year 1999 subtotal				980,215.39

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,107,349.33
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Total: \$1,107,349.33

Cost Calculations for Pipe: 21" @11'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 200 ft
Conduit Type: Gravity Sewer
Depth of Cover: 11 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 14.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	565.26	CY	10.00	5,652.64
Backfill	397.84	CY	25.00	9,945.99
Complete Pavement Restoration	163.80	SY	50.00	8,189.81
Overlay Pavement Restoration	813.98	SY	20.00	16,279.63
Trench Safety	5,683.33	SF	0.50	2,841.67
Spoil Load and Haul	565.26	CY	10.00	5,652.64
Pipe Unit Material Cost	200.00	lf	26.00	5,200.00
Pipe Installation	200.00	lf	27.00	5,400.00
Place Pipe Zone Fill	139.05	CY	25.00	3,476.31
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	200.00	lf	80.00	16,000.00
Dewatering	200.00	lf	60.00	12,000.00
Traffic Control	200.00	lf	10.00	2,000.00
Year 1999 subtotal				95,638.68

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 108,043.02

Total: \$108,043.02

Cost Calculations for Pipe: 21" @10'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1770 ft
Conduit Type: Gravity Sewer
Depth of Cover: 10 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 13.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,650.50	CY	10.00	46,504.95
Backfill	3,168.79	CY	25.00	79,219.79
Complete Pavement Restoration	1,449.60	SY	50.00	72,479.86
Overlay Pavement Restoration	7,203.74	SY	20.00	144,074.72

Trench Safety	46,757.50	SF	0.50	23,378.75
Spoil Load and Haul	4,650.50	CY	10.00	46,504.95
Pipe Unit Material Cost	1,770.00	lf	26.00	46,020.00
Pipe Installation	1,770.00	lf	27.00	47,790.00
Place Pipe Zone Fill	1,230.61	CY	25.00	30,765.35
Manholes	4.00	MH	3,000.00	12,000.00
Existing Utilities	1,770.00	lf	80.00	141,600.00
Dewatering	1,770.00	lf	60.00	106,200.00
Traffic Control	1,770.00	lf	10.00	17,700.00
Year 1999 subtotal				814,238.38

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	919,845.10
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Total: \$919,845.10

Cost Calculations for Pipe: 21" @9'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1650 ft
Conduit Type: Gravity Sewer
Depth of Cover: 9 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 12.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	4,006.99	CY	10.00	40,069.90
Backfill	2,625.74	CY	25.00	65,643.52
Complete Pavement Restoration	1,351.32	SY	50.00	67,565.97
Overlay Pavement Restoration	6,715.35	SY	20.00	134,306.94
Trench Safety	40,287.50	SF	0.50	20,143.75
Spoil Load and Haul	4,006.99	CY	10.00	40,069.90
Pipe Unit Material Cost	1,650.00	lf	26.00	42,900.00
Pipe Installation	1,650.00	lf	27.00	44,550.00
Place Pipe Zone Fill	1,147.18	CY	25.00	28,679.56
Manholes	4.00	MH	3,000.00	12,000.00
Existing Utilities	1,650.00	lf	80.00	132,000.00
Dewatering	1,650.00	lf	60.00	99,000.00
Traffic Control	1,650.00	lf	10.00	16,500.00
Year 1999 subtotal				743,429.54

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	839,852.36
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Total: \$839,852.36

Cost Calculations for Pipe: 21" @8'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 2580 ft
Conduit Type: Gravity Sewer
Depth of Cover: 8 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 11.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	5,752.26	CY	10.00	57,522.62
Backfill	3,592.49	CY	25.00	89,812.27
Complete Pavement Restoration	2,112.97	SY	50.00	105,648.61
Overlay Pavement Restoration	10,500.36	SY	20.00	210,007.22

Trench Safety	57,835.00	SF	0.50	28,917.50
Spoil Load and Haul	5,752.26	CY	10.00	57,522.62
Pipe Unit Material Cost	2,580.00	lf	26.00	67,080.00
Pipe Installation	2,580.00	lf	27.00	69,660.00
Place Pipe Zone Fill	1,793.78	CY	25.00	44,844.41
Manholes	6.00	MH	3,000.00	18,000.00
Existing Utilities	2,580.00	lf	80.00	206,400.00
Dewatering	2,580.00	lf	60.00	154,800.00
Traffic Control	2,580.00	lf	10.00	25,800.00
Year 1999 subtotal				1,136,015.25

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,283,356.43
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Total: \$1,283,356.43

Cost Calculations for Pipe: 21" @7'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 480 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 7 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 10.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	974.71	CY	10.00	9,747.07
Backfill	572.89	CY	25.00	14,322.22
Complete Pavement Restoration	393.11	SY	50.00	19,655.56
Overlay Pavement Restoration	1,953.56	SY	20.00	39,071.11
Trench Safety	9,800.00	SF	0.50	4,900.00
Spoil Load and Haul	974.71	CY	10.00	9,747.07
Pipe Unit Material Cost	480.00	lf	26.00	12,480.00
Pipe Installation	480.00	lf	27.00	12,960.00
Place Pipe Zone Fill	333.73	CY	25.00	8,343.15
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	480.00	lf	80.00	38,400.00
Dewatering	480.00	lf	60.00	28,800.00
Traffic Control	480.00	lf	10.00	4,800.00

Year 1999 subtotal 206,226.17

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 232,973.70

Total: \$232,973.70

Cost Calculations for Pipe: 21" @6'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 2130 ft
Conduit Type: Gravity Sewer
Depth of Cover: 6 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 9.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	3,901.56	CY	10.00	39,015.62
Backfill	2,118.50	CY	25.00	52,962.38
Complete Pavement Restoration	1,744.43	SY	50.00	87,221.53
Overlay Pavement Restoration	8,668.90	SY	20.00	173,378.06

Trench Safety	39,227.50	SF	0.50	19,613.75
Spoil Load and Haul	3,901.56	CY	10.00	39,015.62
Pipe Unit Material Cost	2,130.00	lf	26.00	55,380.00
Pipe Installation	2,130.00	lf	27.00	57,510.00
Place Pipe Zone Fill	1,480.91	CY	25.00	37,022.71
Manholes	5.00	MH	3,000.00	15,000.00
Existing Utilities	2,130.00	lf	80.00	170,400.00
Dewatering	2,130.00	lf	60.00	127,800.00
Traffic Control	2,130.00	lf	10.00	21,300.00
Year 1999 subtotal				895,619.67

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,011,781.54
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Total: \$1,011,781.54

Cost Calculations for Pipe: 21" @5'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 270 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 5 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy

Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
 Trench Width 5.371 ft
 Excavation Depth 8.208 ft
 Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	440.86	CY	10.00	4,408.56
Backfill	214.83	CY	25.00	5,370.83
Complete Pavement Restoration	221.12	SY	50.00	11,056.25
Overlay Pavement Restoration	1,098.88	SY	20.00	21,977.50
Trench Safety	4,432.50	SF	0.50	2,216.25
Spoil Load and Haul	440.86	CY	10.00	4,408.56
Pipe Unit Material Cost	270.00	lf	26.00	7,020.00
Pipe Installation	270.00	lf	27.00	7,290.00
Place Pipe Zone Fill	187.72	CY	25.00	4,693.02
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	270.00	lf	80.00	21,600.00
Dewatering	270.00	lf	60.00	16,200.00
Traffic Control	270.00	lf	10.00	2,700.00

Year 1999 subtotal 111,940.97

Mobilization/Demobilization at 10% 1.10
 Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03
 Effective Multiplier 1.13

Subtotal 126,459.71

Total: \$126,459.71

Cost Calculations for Pipe: 21" @4'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 4165 ft
Conduit Type: Gravity Sewer
Depth of Cover: 4 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 21 in.

Geometry

Outer Diameter 2.208 ft
Trench Width 5.371 ft
Excavation Depth 7.208 ft
Complete Surface Rest. Width 7.371 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	5,972.11	CY	10.00	59,721.10
Backfill	2,485.50	CY	25.00	62,137.56
Complete Pavement Restoration	3,411.06	SY	50.00	170,552.89
Overlay Pavement Restoration	16,951.16	SY	20.00	339,023.29

Trench Safety	60,045.42	SF	0.50	30,022.71
Spoil Load and Haul	5,972.11	CY	10.00	59,721.10
Pipe Unit Material Cost	4,165.00	lf	26.00	108,290.00
Pipe Installation	4,165.00	lf	27.00	112,455.00
Place Pipe Zone Fill	2,895.77	CY	25.00	72,394.17
Manholes	9.00	MH	3,000.00	27,000.00
Existing Utilities	4,165.00	lf	80.00	333,200.00
Dewatering	4,165.00	lf	60.00	249,900.00
Traffic Control	4,165.00	lf	10.00	41,650.00
Year 1999 subtotal				1,666,067.81

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	1,882,156.80
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Total: \$1,882,156.80

Cost Calculations for Project: 18"

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
18" @10' Pipe		2000	211,196.89	1.00	211,196.89
18" @9' Pipe		2000	492,221.32	1.00	492,221.32
18" @7' Pipe		2000	195,404.63	1.00	195,404.63
18" @6' Pipe		2000	898,412.30	1.00	898,412.30

18" @5'	Pipe	2000	779,192.38	1.00	779,192.38
18" @4'	Pipe	2000	524,739.23	1.00	524,739.23
					Subtotal 3,101,166.75

Total: \$3,101,166.75

Cost Calculations for Pipe: 18" @10'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 500 ft
Conduit Type: Gravity Sewer
Depth of Cover: 10 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917	ft
Trench Width	4.992	ft
Excavation Depth	12.917	ft
Complete Surface Rest. Width	6.992	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
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Excavation	1,193.99	CY	10.00	11,939.94
Backfill	831.94	CY	25.00	20,798.61
Complete Pavement Restoration	388.43	SY	50.00	19,421.30
Overlay Pavement Restoration	833.80	SY	20.00	16,675.93
Trench Safety	12,916.67	SF	0.50	6,458.33
Spoil Load and Haul	1,193.99	CY	10.00	11,939.94
Pipe Unit Material Cost	500.00	lf	23.00	11,500.00
Pipe Installation	500.00	lf	25.00	12,500.00
Place Pipe Zone Fill	308.62	CY	25.00	7,715.48
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	500.00	lf	60.00	30,000.00
Dewatering	500.00	lf	60.00	30,000.00
Traffic Control	500.00	lf	10.00	5,000.00

Year 1999 subtotal 186,949.54

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	211,196.89
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Total: \$211,196.89

Cost Calculations for Pipe: 18" @9'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1190 ft
Conduit Type: Gravity Sewer
Depth of Cover: 9 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)

Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Half Width - Arterial (22 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917	ft
Trench Width	4.992	ft
Excavation Depth	11.917	ft
Complete Surface Rest. Width	6.992	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	2,621.70	CY	10.00	26,217.03
Backfill	1,760.02	CY	25.00	44,000.62
Complete Pavement Restoration	924.45	SY	50.00	46,222.69
Overlay Pavement Restoration	1,984.44	SY	20.00	39,688.70
Trench Safety	28,361.67	SF	0.50	14,180.83
Spoil Load and Haul	2,621.70	CY	10.00	26,217.03
Pipe Unit Material Cost	1,190.00	lf	23.00	27,370.00
Pipe Installation	1,190.00	lf	25.00	29,750.00
Place Pipe Zone Fill	734.51	CY	25.00	18,362.85
Manholes	3.00	MH	3,000.00	9,000.00
Existing Utilities	1,190.00	lf	60.00	71,400.00
Dewatering	1,190.00	lf	60.00	71,400.00
Traffic Control	1,190.00	lf	10.00	11,900.00
Year 1999 subtotal				435,709.76

Mobilization/Demobilization at 10%	1.10
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Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13
Subtotal	492,221.32

Total: \$492,221.32

Cost Calculations for Pipe: 18" @7'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 500 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 7 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917 ft
Trench Width	4.992 ft
Excavation Depth	9.917 ft
Complete Surface Rest. Width	6.992 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	916.68	CY	10.00	9,166.80
Backfill	554.63	CY	25.00	13,865.74
Complete Pavement Restoration	388.43	SY	50.00	19,421.30
Overlay Pavement Restoration	833.80	SY	20.00	16,675.93
Trench Safety	9,916.67	SF	0.50	4,958.33
Spoil Load and Haul	916.68	CY	10.00	9,166.80
Pipe Unit Material Cost	500.00	lf	23.00	11,500.00
Pipe Installation	500.00	lf	25.00	12,500.00
Place Pipe Zone Fill	308.62	CY	25.00	7,715.48
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	500.00	lf	60.00	30,000.00
Dewatering	500.00	lf	60.00	30,000.00
Traffic Control	500.00	lf	10.00	5,000.00
Year 1999 subtotal				172,970.37

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	195,404.63
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Total: \$195,404.63

Cost Calculations for Pipe: 18" @6'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 2360 ft
Conduit Type: Gravity Sewer
Depth of Cover: 6 ft
Trench Backfill Type: Imported

Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917 ft
Trench Width	4.992 ft
Excavation Depth	8.917 ft
Complete Surface Rest. Width	6.992 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	3,890.42	CY	10.00	38,904.19
Backfill	2,181.54	CY	25.00	54,538.58
Complete Pavement Restoration	1,833.37	SY	50.00	91,668.52
Overlay Pavement Restoration	3,935.52	SY	20.00	78,710.37
Trench Safety	42,086.67	SF	0.50	21,043.33
Spoil Load and Haul	3,890.42	CY	10.00	38,904.19
Pipe Unit Material Cost	2,360.00	lf	23.00	54,280.00
Pipe Installation	2,360.00	lf	25.00	59,000.00
Place Pipe Zone Fill	1,456.68	CY	25.00	36,417.09
Manholes	5.00	MH	3,000.00	15,000.00
Existing Utilities	2,360.00	lf	60.00	141,600.00
Dewatering	2,360.00	lf	60.00	141,600.00
Traffic Control	2,360.00	lf	10.00	23,600.00
Year 1999 subtotal				795,266.26

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13
Subtotal	898,412.30

Total: \$898,412.30

Cost Calculations for Pipe: 18" @5'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 2100 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 5 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917 ft
Trench Width	4.992 ft
Excavation Depth	7.917 ft
Complete Surface Rest. Width	6.992 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	3,073.57	CY	10.00	30,735.73
Backfill	1,552.96	CY	25.00	38,824.07
Complete Pavement Restoration	1,631.39	SY	50.00	81,569.44
Overlay Pavement Restoration	3,501.94	SY	20.00	70,038.89
Trench Safety	33,250.00	SF	0.50	16,625.00
Spoil Load and Haul	3,073.57	CY	10.00	30,735.73
Pipe Unit Material Cost	2,100.00	lf	23.00	48,300.00
Pipe Installation	2,100.00	lf	25.00	52,500.00
Place Pipe Zone Fill	1,296.20	CY	25.00	32,405.04
Manholes	5.00	MH	3,000.00	15,000.00
Existing Utilities	2,100.00	lf	60.00	126,000.00
Dewatering	2,100.00	lf	60.00	126,000.00
Traffic Control	2,100.00	lf	10.00	21,000.00
Year 1999 subtotal				689,733.89

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	779,192.38
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Total: \$779,192.38

Cost Calculations for Pipe: 18" @4'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 1460 ft
Conduit Type: Gravity Sewer
Depth of Cover: 4 ft
Trench Backfill Type: Imported

Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 18 in.

Geometry

Outer Diameter	1.917 ft
Trench Width	4.992 ft
Excavation Depth	6.917 ft
Complete Surface Rest. Width	6.992 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	1,866.94	CY	10.00	18,669.45
Backfill	809.76	CY	25.00	20,243.98
Complete Pavement Restoration	1,134.20	SY	50.00	56,710.19
Overlay Pavement Restoration	2,434.69	SY	20.00	48,693.70
Trench Safety	20,196.67	SF	0.50	10,098.33
Spoil Load and Haul	1,866.94	CY	10.00	18,669.45
Pipe Unit Material Cost	1,460.00	lf	23.00	33,580.00
Pipe Installation	1,460.00	lf	25.00	36,500.00
Place Pipe Zone Fill	901.17	CY	25.00	22,529.22
Manholes	3.00	MH	3,000.00	9,000.00
Existing Utilities	1,460.00	lf	60.00	87,600.00
Dewatering	1,460.00	lf	60.00	87,600.00
Traffic Control	1,460.00	lf	10.00	14,600.00
Year 1999 subtotal				464,494.32

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13
Subtotal	524,739.23

Total: \$524,739.23

Cost Calculations for Project: **15"**

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
15" @11' Pipe		2000	373,653.16	1.00	373,653.16
			Subtotal		373,653.16

Total: \$373,653.16

Cost Calculations for Pipe: **15" @11'**

Project year: 2000

Assumptions

Construction Year: 2000

Length: 800 ft

Conduit Type: Gravity Sewer

Depth of Cover: 11 ft

Trench Backfill Type: Imported

Manhole Spacing: Average (500 ft)

Existing Utilities: Complex

Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easements: None
 Trench Safety: Standard
 Pipe Diameter: 15 in.

Geometry

Outer Diameter	1.667	ft
Trench Width	4.667	ft
Excavation Depth	13.667	ft
Complete Surface Rest. Width	6.667	ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	1,889.71	CY	10.00	18,897.12
Backfill	1,382.72	CY	25.00	34,567.90
Complete Pavement Restoration	592.59	SY	50.00	29,629.63
Overlay Pavement Restoration	3,318.52	SY	20.00	66,370.37
Trench Safety	21,866.67	SF	0.50	10,933.33
Spoil Load and Haul	1,889.71	CY	10.00	18,897.12
Pipe Unit Material Cost	800.00	lf	18.00	14,400.00
Pipe Installation	800.00	lf	20.00	16,000.00
Place Pipe Zone Fill	442.35	CY	25.00	11,058.85
Manholes	2.00	MH	3,000.00	6,000.00
Existing Utilities	800.00	lf	60.00	48,000.00
Dewatering	800.00	lf	60.00	48,000.00
Traffic Control	800.00	lf	10.00	8,000.00
Year 1999 subtotal				330,754.32

Mobilization/Demobilization at 10% 1.10

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.13

Subtotal 373,653.16

Total: \$373,653.16

Cost Calculations for Project: 12"

Project year: 2000

Assumptions

Project Year: 2000

Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
12" @7' Pipe		2000	117,211.24	1.00	117,211.24
12" @4' Pipe		2000	23,744.41	1.00	23,744.41
			Subtotal		140,955.65

Total: \$140,955.65

Cost Calculations for Pipe: 12" @7'

Project year: 2000

Assumptions

Construction Year: 2000

Length: 310 ft

Conduit Type: Gravity Sewer

Depth of Cover: 7 ft

Trench Backfill Type: Imported

Manhole Spacing: Average (500 ft)

Existing Utilities: Complex

Dewatering: Significant

Pavement Restoration: Full Width - Arterial (44 ft)

Traffic: Heavy

Right of Way: None

Required Easements: None

Trench Safety: Standard

Pipe Diameter: 12 in.

Geometry

Outer Diameter 1.417 ft

Trench Width 4.342 ft

Excavation Depth 9.417 ft

Complete Surface Rest. Width 6.342 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	469.41	CY	10.00	4,694.09
Backfill	299.09	CY	25.00	7,477.31
Complete Pavement Restoration	218.44	SY	50.00	10,921.76
Overlay Pavement Restoration	1,297.12	SY	20.00	25,942.41
Trench Safety	5,838.33	SF	0.50	2,919.17
Spoil Load and Haul	469.41	CY	10.00	4,694.09
Pipe Unit Material Cost	310.00	lf	15.00	4,650.00
Pipe Installation	310.00	lf	15.00	4,650.00
Place Pipe Zone Fill	152.22	CY	25.00	3,805.47
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	310.00	lf	40.00	12,400.00
Dewatering	310.00	lf	50.00	15,500.00
Traffic Control	310.00	lf	10.00	3,100.00

Year 1999 subtotal 103,754.31

Mobilization/Demobilization at 10% 1.10

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier 1.13

Subtotal

117,211.24

Total: \$117,211.24

Cost Calculations for Pipe: 12" @4'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 60 ft
Conduit Type: Gravity Sewer
Depth of Cover: 4 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 12 in.

Geometry

Outer Diameter 1.417 ft
Trench Width 4.342 ft
Excavation Depth 6.417 ft
Complete Surface Rest. Width 6.342 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	61.91	CY	10.00	619.09

Backfill	28.94	CY	25.00	723.61
Complete Pavement Restoration	42.28	SY	50.00	2,113.89
Overlay Pavement Restoration	251.06	SY	20.00	5,021.11
Trench Safety	770.00	SF	0.50	385.00
Spoil Load and Haul	61.91	CY	10.00	619.09
Pipe Unit Material Cost	60.00	lf	15.00	900.00
Pipe Installation	60.00	lf	15.00	900.00
Place Pipe Zone Fill	29.46	CY	25.00	736.54
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	60.00	lf	40.00	2,400.00
Dewatering	60.00	lf	50.00	3,000.00
Traffic Control	60.00	lf	10.00	600.00
Year 1999 subtotal				21,018.33

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	23,744.41
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Total: \$23,744.41

Cost Calculations for Project: 10"

Project year: 2000

Assumptions

Project Year: 2000
Comments:

Sub Items

Name	Type	Year	Cost	Multiplier	2000 Cost
10" @7' Pipe		2000	111,121.32	1.00	111,121.32

10" @4' Pipe	2000	22,730.94	1.00	22,730.94
Subtotal				133,852.25

Total: \$133,852.25

Cost Calculations for Pipe: 10" @7'

Project year: 2000

Assumptions

Construction Year: 2000
Length: 310 ft
Conduit Type: Gravity Sewer
Depth of Cover: 7 ft
Trench Backfill Type: Imported
Manhole Spacing: Average (500 ft)
Existing Utilities: Complex
Dewatering: Significant
Pavement Restoration: Full Width - Arterial (44 ft)
Traffic: Heavy
Right of Way: None
Required Easements: None
Trench Safety: Standard
Pipe Diameter: 10 in.

Geometry

Outer Diameter	1.042 ft
Trench Width	3.854 ft
Excavation Depth	9.042 ft
Complete Surface Rest. Width	5.854 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	400.11	CY	10.00	4,001.08

Backfill	265.51	CY	25.00	6,637.73
Complete Pavement Restoration	201.64	SY	50.00	10,082.18
Overlay Pavement Restoration	1,313.91	SY	20.00	26,278.24
Trench Safety	5,605.83	SF	0.50	2,802.92
Spoil Load and Haul	400.11	CY	10.00	4,001.08
Pipe Unit Material Cost	310.00	lf	12.00	3,720.00
Pipe Installation	310.00	lf	12.00	3,720.00
Place Pipe Zone Fill	124.81	CY	25.00	3,120.34
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	310.00	lf	40.00	12,400.00
Dewatering	310.00	lf	50.00	15,500.00
Traffic Control	310.00	lf	10.00	3,100.00
Year 1999 subtotal				98,363.56

Mobilization/Demobilization at 10%	1.10
Projected Inflation Multiplier from 1999 to 2000 at 2.7%	1.03
Effective Multiplier	1.13

Subtotal	111,121.32
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Total: \$111,121.32

Cost Calculations for Pipe: 10" @4'

Project year: 2000

Assumptions

Construction Year: 2000
 Length: 60 ft
 Conduit Type: Gravity Sewer
 Depth of Cover: 4 ft
 Trench Backfill Type: Imported
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex

Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy
 Right of Way: None
 Required Easments: None
 Trench Safety: Standard
 Pipe Diameter: 10 in.

Geometry

Outer Diameter	1.042 ft
Trench Width	3.854 ft
Excavation Depth	6.042 ft
Complete Surface Rest. Width	5.854 ft

Unit Costs (Basis 1999)

Item	Quantity	Unit	Unit Cost	ItemCost
Excavation	51.75	CY	10.00	517.46
Backfill	25.69	CY	25.00	642.36
Complete Pavement Restoration	39.03	SY	50.00	1,951.39
Overlay Pavement Restoration	254.31	SY	20.00	5,086.11
Trench Safety	725.00	SF	0.50	362.50
Spoil Load and Haul	51.75	CY	10.00	517.46
Pipe Unit Material Cost	60.00	lf	12.00	720.00
Pipe Installation	60.00	lf	12.00	720.00
Place Pipe Zone Fill	24.16	CY	25.00	603.94
Manholes	1.00	MH	3,000.00	3,000.00
Existing Utilities	60.00	lf	40.00	2,400.00
Dewatering	60.00	lf	50.00	3,000.00
Traffic Control	60.00	lf	10.00	600.00

Year 1999 subtotal 20,121.21

Mobilization/Demobilization at 10% 1.10

Projected Inflation Multiplier from 1999 to 2000 at 2.7% 1.03

Effective Multiplier	1.13
Subtotal	22,730.94
Total: \$22,730.94	